December 17, 1895.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

Dr. Donaldson Smith gave an account of some of the animals observed by him during his recent expedition to Lakes Rudolph and Stephanie, and alluded specially to the various species of Zebras and Antelopes which he had encountered during his journey.

Mr. Donaldson Smith's remarks were as follows:—

"Commencing 20 miles east of the Shebeli River, the range of the Grévy's Zebra (*Equus grevii*) extends about 120 miles to the west; it is limited by the second and the eighth degrees of latitude. On passing the Juba River you find Burchell's Zebra (*Equus burchelli*) in great herds among the mountains of the Boran country, but no Grévy's Zebras until Lake Stephanie is reached. Here you find the ranges of the two species overlapping to a slight extent. About Lake Rudolph I met with only Grévy's Zebra. The greatest altitude at which I found it was about 4700 feet.

"I did not see Swayne's Hartebeest (*Bubalis swaynei*) outside the plains of Central Somaliland.

"Coke's Hartebeest (*Bubalis cokii*) occurs on the grassy plateaus north of Lake Stephanie.

"About Lake Rudolph the Topé (*Damaliscus jimela*) is found in great numbers, but no other Hartebeest. I saw one lot of fine Coke's Hartebeest fifty miles north of Lake Rudolph.

"About the river running into Lake Stephanie there is a very light reddish-grey Waterbuck (*Cobus*), of which I have not yet made out the name. I brought back one specimen of it, with horns 29½ in. long. It was 51 in. high at the shoulder.[1] The hair is not so coarse as in the case of other Waterbucks, and there was no dark line behind. There was also a small reddish-grey Antelope, or allied animal, about this same river; it was 42 in. high and had straight horns, except near the point, where they appeared to have a slight backward curve, the horns were about 13 in. long. This was also seen in the hills near water.

"I saw Grant's Gazelle (*Gazella granti*) first in the Boran Country a little west of long. 39° W. They extended as far as lat. 6° N., and were seen in great numbers all along my route to the Tana River.

"Sœmmerring's Gazelle (*Gazella sœmmerringi*) I did not see far beyond the Juba River."

Mr. Sclater called attention to a very fine head of the so-called "Kob" Antelope of Kavirondo and Uganda, belonging to Mr. Ernest Gedge, and lent by him for exhibition. Mr. Gedge had shot the Antelope from which this specimen had been taken at Berkely Bay, on Lake Victoria, when returning from Uganda in 1893.

In Mr. F. J. Jackson's excellent account of the British East

[1] [The specimen, which Dr. Donaldson Smith has kindly allowed me to examine, is referable to *Cobus defassa* (Rüpp.).—P. L. S.]

African Antelopes in the first volume of 'Big Game Shooting,' in the Badminton Library (p. 296), this Antelope had been named "*Kobus kob*," probably from a mounted specimen of it in the British Museum having been so labelled. In Herr Matschie's

Head of *Cobus thomasi*, ♂. (From Mr. Gedge's specimen.)

recently published volume on German-East-African Mammals (p. 126) it had been also referred to the West-African Kob. But Mr. Thomas and Mr. Sclater had quite agreed that this determination was wrong, the West-African Kob being a much smaller animal.

When recently examining the specimens of this Antelope in the British Museum, Herr Oscar Neumann had come to the same conclusion, and had affixed to one of them the MS. name *Cobus thomasi*, under which he proposed to describe it.

The future name of the so-called Kob of British East Africa would be therefore *Cobus thomasi*, Neumann.

The following papers were read :—

1. On *Cænolestes*, a still Existing Survivor of the *Epanorthidæ* of Ameghino, and the Representative of a new Family of recent Marsupials. By Oldfield Thomas, F.Z.S.

[Received November 11, 1895.]

(Plate L.)

In the 'Proceedings' of the Society for 1860[1], Mr. R. F. Tomes, in working out a collection of small mammals obtained by Mr. Louis Fraser in Ecuador, published the first notice of the genus which forms the subject of the present paper. He spoke of his specimen as "a small animal about the size of a Water-Shrew," but "having a small and rudimentary pouch," and three years later[2] gave a technical description of it under the name of *Hyracodon fuliginosus*.

This technical description was unfortunately unaccompanied by any remarks on the relationships of the animal, a want which has made itself felt by the entire failure of later authors to make out from the description what animal Mr. Tomes had before him.

In fact I only know of two references to *Hyracodon* at all (those mentioned in the footnote [3]), and in both the authors express their inability to make anything of the description, although the first-named acutely suggested that the animal "might represent a distinct family," a suggestion most fully borne out by an examination of the specimen I now have the honour of bringing before the Society.

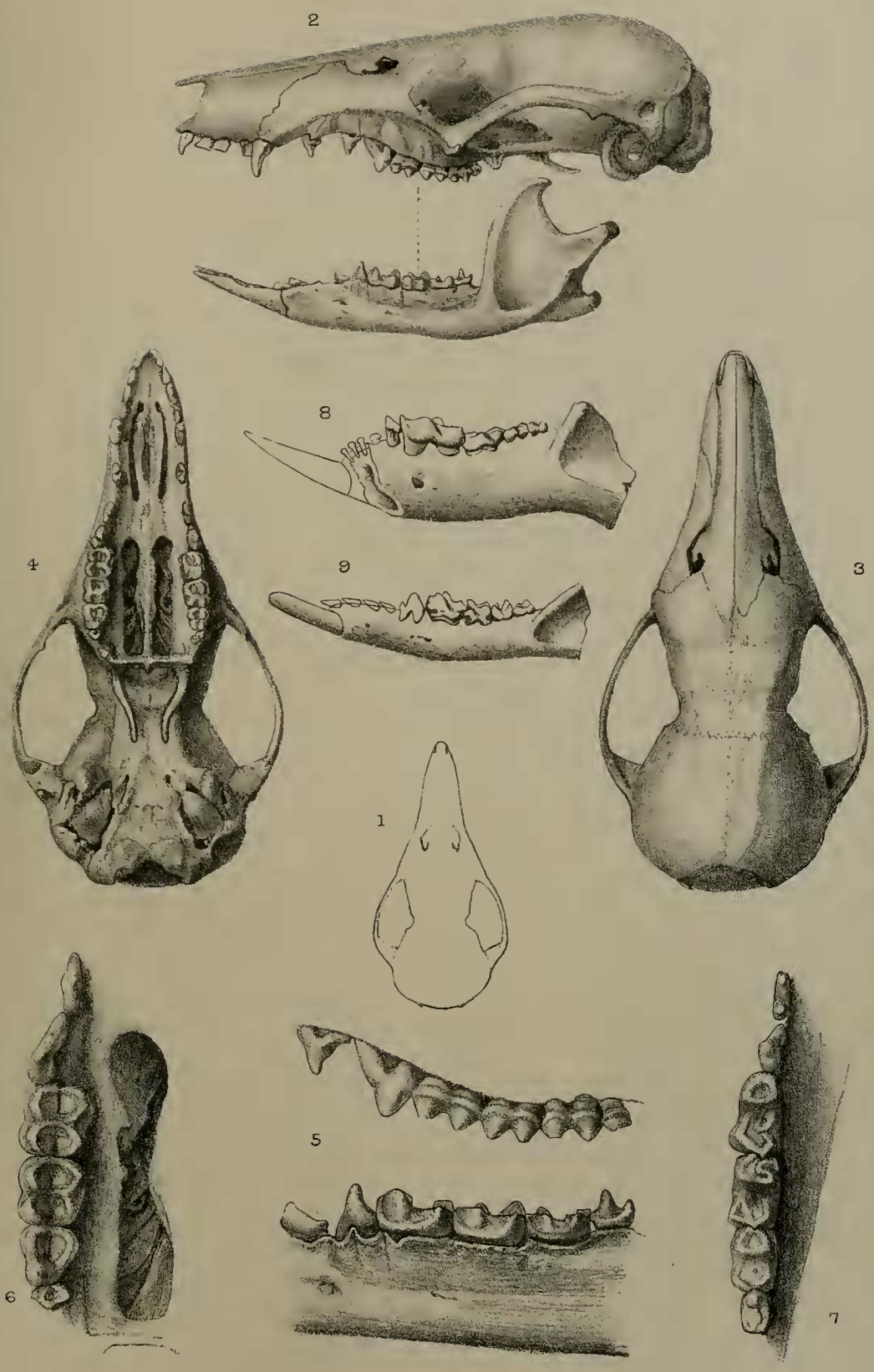
In vindication of Mr. Tomes's paper I should like to say, firstly, that his description, hitherto supposed (from our ignorance of any such animal) to be imperfect or incorrect, proves to agree, so far as it goes, very closely with the present specimen; and secondly, that remarks on the affinities of the animal must have been at that date more easily wanted than given, since even now, with infinitely greater material and the best of advice[4], I am unable to be at all

[1] P. Z. S. 1860, p. 213.

[2] P. Z. S. 1863, p. 50, pl. viii. (animal).

[3] Alston, Biol. Centr.-Am., Mamm. p. 195 (footnote), 1880; Thomas, Cat. Mars. B. M. p. 370 (1880).

[4] I would specially mention my indebtedness to Mr. R. Lydekker, whose own extreme interest in the present animal has expressed itself in abundant and most serviceable help to me in working it out.



A.T.Hollick del et lith.

West, Newman imp

Cœnolestes obscurus.

positive about the exact position and relationships of the little marsupial described by Mr. Tomes.

It unfortunately happened that the name given by Mr. Tomes, *Hyracodon*[1], was preoccupied by the Ungulate *Hyracodon* of Leidy[2], so that the genus has now had to be renamed, and I have proposed for it[3] the name *Cœnolestes*[4], as it is a modern member of an ancient group of fossil marsupials, among which the affix *-lestes* has been often employed.

The specimen on which the present account is based was obtained near Bogotá by an Indian in the employment of my kind Colombian correspondent Mr. Geo. D. Child, and the latter is to be congratulated on the capture of such a prize. In fact the rediscovery of Tomes's genus, both on account of its having so long been a puzzle to zoologists, and still more on account of the relationship it proves to possess to long extinct fossil forms, I venture to consider one of the most interesting events that have happened in mammalogy for many years.

Comparing it, as one may not unnaturally do, with Dr. Stirling's discovery of *Notoryctes*, also representing an additional family of Marsupials, one sees that while the latter is of surpassing interest to the general zoologist on account of the entire novelty of its structure and its unique adaptation (among Marsupials) to a talpine life, *Cœnolestes*, with its uninteresting exterior, appeals mainly to the technical Mammalogist. To him, however, with its intense palæontological and geographical interest, and the added puzzle its structure gives rise to in the general classification of the order, no animal will appear more important or more worthy of close and detailed study.

That by the arrival of spirit-specimens any such admirable account of its anatomy may be rendered possible as the one on *Notoryctes* by Dr. Gadow is very much to be hoped. The present specimen is a skin with a perfect skull. It is an old individual, and the teeth are apparently rather worn, so that for a clear detailed knowledge of their structure we must still wait for further examples. With this exception the following is a description of the genus, so far as the external characters and skull are concerned. To keep the description together and to avoid repetition, I have included both such characters as may possibly prove to be only of specific value and those that are clearly of family rank. A short analysis of them is, however, given later.

It has been found necessary (*l. c.*) to consider the Bogotan example as representing a new species, named *Cœnolestes obscurus*, but it is evidently so closely allied to *C. fuliginosus* that for the

[1] I am informed by Mr. Sclater that this name had no reference to *Hyrax* as zoologists know it, *i.e. Procavia*, but to ὕραξ, a shrew, the word therefore most appropriately meaning Shrew-tooth.

[2] Proc. Ac. Philad. viii. p. 91 (1856).

[3] Ann. Mag. N. H. (6) xvi. p. 367 (1895).

[4] καινὸς, modern ; λῃστὴς, a pirate or other predatory person.

purposes of this paper, which deals mainly with generic characters, the two have been treated as one. There are, it is true, certain slight differences between Mr. Tomes's description of the teeth of *C. fuliginosus* and those of the type of *C. obscurus*, but whether these differences are due to age or specific distinction cannot be made out without direct comparison.

Cænolestes.

General appearance not unlike that of a Rat or small Opossum. External characters very much as in the Dasyurid genus *Phascologale*. Head elongate. Nose naked, both in front and on the top of the muzzle. Ears short, squarish, their inner surfaces provided with several (three in *C. obscurus*) tragoid projections. Fore feet with five toes, of which the outer one, as well as the pollex, has a distinct *nail*, while the middle three digits have each a well-developed curved claw. The third digit is the longest, the second and fourth subequal, about 1 mm. shorter; fifth reaching to the end of the first phalanx of the fourth, first to the middle of the same phalanx of the second. Palms naked, with one elongated carpal pad, three ordinary digital, and one pollical pad. Hind foot of normal shape, not syndactylous, and not modified into a hand as in the Opossums. Hallux short, clawless, not properly opposable[1], its development very much as in *Phascologale wallacei*[2]. Other digits subequal, the fourth slightly the longest; all provided with claws. Soles naked, with 6 pads, situated very much as is shown in the figure of *Phascologale wallacei* just referred to; but all rather more elongated and not transversely striated. Tail long, slender, rat-like; so thinly haired as to appear naked, its terminal inch below wholly naked; it is therefore presumably prehensile. "A small and rudimentary pouch present" (Tomes).

Skull in its general proportions something like that of a *Perameles*, although thinner and more delicately built, with a similarly elongated muzzle, smooth and rounded brain-case, and obsolete supraorbital and cranial crest and ridges; the zygomata are, however, so much more boldly expanded as somewhat to spoil the resemblance, which in any case does not apply to details. Nasals long, thin, anterior two-thirds narrow, almost parallel-sided, but a little tapering forwards, their posterior third well expanded, somewhat as in ordinary *Didelphys*, but not expanded enough to meet the upper edge of the maxillary bone. As a result, an anteorbital vacuity is left on each side in the position of, and formed in exactly the same way as that of, so many Ruminants. Apart from the latter group, this vacuity is perfectly unique among Mammals, and therefore is well worthy of special note.

[1] Mr. Tomes says "feet furnished with an opposable thumb," but the opposition, at least in *C. obscurus*, is by no means comparable with that of *Didelphys*. In the plate neither pollex nor hallux is shown as opposable, and both they and the fifth digit of the hand are ornamented with long claws, about the presence of which I venture to be somewhat sceptical.

[2] Figured 'Cat. Marsupials,' pl. xxiii. fig. 3.

The vacuity, judging from the spicules of bone which project into it from the nasals, and from its known development in the Ruminants, probably tends to ossify over as life advances, but—the specimen being old—evidently never entirely fills up. Interorbital space broad, smooth and rounded, with scarcely a trace of ridges, ledges, or postorbital processes; lambdoid ridges, however, fairly well developed. Lacrymal canal single, just on the rounded edge of the orbit. Zygomata slender, boldly expanded; malar as usual running back to form part of the glenoid fossa. Palate very imperfect, the anterior foramina reaching from between the third pair of incisors to halfway between the anterior and middle premolars; posterior vacuities extending from the large posterior premolar to behind the last molar, the bridge between their front limit and the back of the anterior foramina only 2·7 mm. across. Pterygoid processes slender and delicate, pointing backwards and inwards, their needle-like ends 1·6 mm. long. Bullæ small, imperfect, transparent, formed as usual by the alisphenoids. Tympanic annular, but imperfect, only forming about three-fourths of a circle.

Dentition. I. $\frac{4}{3}$; C. $\frac{1}{1}$; P. $\frac{3}{3}$; M. $\frac{4}{4}\times 2=46$.

Viewed as a whole, the teeth present a considerable resemblance to those of the Australian *Dromicia* (e.g. *D. lepida*, figured Cat. Mars. B. M. pl. xvi. figs. 2–5), especially in their relative proportions.

Upper Jaw.—Incisors four in number; the first vertical, pointed, touching its fellow of the opposite side, but separated from i^2, in fact very similar to its condition in *Didelphys*. I^2 and i^3 flattened laterally, not pointed, but with a straight cutting-edge; i^2 separated from i^3, smaller and rather more pointed [1]. Canines well-developed, as in average carnivorous Marsupials. Anterior and middle premolars small, narrow, two-rooted, sharply pointed, equal in size, the distance between them about equal to that behind the canine. Posterior premolar somewhat similar, but twice as large and rather thicker transversely, with one long main cusp, which stands up just higher than any cusp on the molars, and a small anterior secondary cusp, placed slightly internally. Molars low-crowned, with low rounded or scarcely pointed cusps, not unlike those of *Petaurus* or *Dromicia*; the two anterior square, quadricuspidate, although apparently [2] there are only three roots to each tooth, the postero-internal cusp being placed on a sort of flange overhanging the palate and not supported by a root; third molar similar, but without the extra postero-internal cusp; last molar minute, triangular, as small in cross-section as the last incisor.

Lower Jaw.—Anterior incisor elongated, exactly as in typical

[1] On the left side (as shown in Plate L.) this tooth has been displaced and pressed against the front of the canine, but on the right side, which appears to be normal, there is a small diastema.

[2] It is at present impossible to be quite certain as to the number of roots each tooth possesses, as the teeth are so firmly wedged in that without damaging the skull, as yet unique, they cannot be pulled out or their roots developed.

Diprotodonts, its length in front of the jaw-bone exceeding that of the three anterior molars. Succeeding it, just as in the same Australian group, are four minute unicuspid teeth, which it seems best for the present tentatively to call two premolars, one canine and a premolar. Any other determination would involve the presence of four incisors or four premolars, each equally unlikely. Then come two narrow, pointed, two-rooted teeth, obviously premolars, the posterior slightly longer than the anterior, and, as in the upper jaw, just overtopping the molars. Molars low-crowned, more or less oval in section, and each with two roots. Their pattern is difficult to make out accurately, owing to a doubt as to how far they are affected by wear. The anterior ones each seem to have two curved or angular crests, whose concavity is directed inwards, somewhat similar to those of the Indian Rhinoceros, but they are far less distinct; the posterior is larger and more open as compared with the much smaller and less open anterior one, and they are very probably produced in a wholly different way; the anterior crest is decidedly higher than the posterior. The last molar is much smaller than the other, and has two pointed cusps corresponding to the crests of the other teeth: both rather inwards of the middle line.

The following are some dimensions of the specimen described, the type of *C. obscurus*:—

Head and body 151 mm.; tail 144; hind foot without claws 23; heel to end of hallux 14·2; hallux 3·2; ear 12×11·5.

Skull—basal length 33·6; greatest length in middle line 36; greatest breadth 18; nasals, length 17·8, greatest breadth, approximately, 5·4; intertemporal breadth 7; breadth of brain-case 12·8; height of brain-case above basilar suture 9; palate, length from gnathion 20·6, breadth outside $\underline{m^2}$ 8·3, inside $\underline{m^2}$ 5; anterior palatine foramina 6·2; length of palatal vacuities $\overline{7{\cdot}2}$; combined length of $\underline{ms.^{1-3}}$ 5·1. Lower jaw, length from condyle, bone only, 23·8, including $\underline{i_1}$ 28·5; height of coronoid above angle 10; vertical thickness of ramus below m_1 3; length of i_1 beyond bone above 6; length of lower molar series 6·9.

We may now pass from these necessary, but dry and uninteresting details to the important question as to what Marsupial *Cœnolestes* is most nearly allied to, for Marsupial it is in every character. With regard to living members of the order, the answer can only be that it is allied, at least closely, to none, but that, so far as it has any existing relations, these are distinctly the Australian rather than the American Marsupials. For it is clearly a Diprotodont, as not only does it possess the characteristic development of the lower incisors, but even the molars resemble most closely in structure those of certain members of the family *Phalangeridæ*, while being wholly unlike those of the typical Polyprotodonts.

From all of the existing Diprotodonts, however, apart from its habitat and numerous detailed differences, *Cœnolestes* is at once distinguished by its not being syndactylous, a character which is

always considered as of family rank. It forms, therefore, among existing Marsupials a peculiar Family, and one which in America represents the Diprotodonts of Australia, just as the *Didelphyidæ* do the Polyprotodonts.

But turning to extinct Marsupials, the allies of *Cœnolestes* are readily found. For among the large numbers of fossils from the Santa Cruz beds of Patagonia described during the last few years by Señor Florentino Ameghino, of La Plata, there are some which so closely resemble *Cœnolestes* that no one can have the slightest doubt as to their being really related to it.

These are the *Epanorthidæ* and *Decastidæ* of Ameghino, and, rather farther removed, the *Abderitidæ* of the same author. The last-named have a hypertrophied trenchant last lower premolar, and may for the present be put on one side. The other two, however, which contain, according to their describer, some 13 genera in all, show a dentition which cannot be distinguished from that of *Cœnolestes* in any character of family importance. Indeed, I fail, no doubt from only having descriptions and figures instead of actual specimens, to understand why Señor Ameghino distinguishes them from each other. But as the earliest named family, the *Epanorthidæ*, contains some of the forms most closely allied to *Cœnolestes*, we may safely ignore for the present the *Decastidæ*, and speak of the fossil allies of *Cœnolestes* simply as *Epanorthidæ*.

Further, after a careful examination of the characters of the different fossil genera, I am prepared to say that *Cœnolestes* is not only allied to, but actually falls into the Family, so that the name *Epanorthidæ* must be used for its recent as well as fossil members.

The best account of the fossil *Epanorthidæ* is contained in a paper by Ameghino [1], published in 1893, and giving a full list of all the genera and species described up to that date, with woodcuts of many of their jaws and teeth. Of these woodcuts I have ventured to copy two (see Pl. L. figs. 8 & 9), those of the lower jaws of *Decastis columnaris* (p. 341) and *Parepanorthus minutus* (p. 350), which will show the exceedingly close alliance of *Cœnolestes* with those long-extinct Patagonian Marsupials.

Again, in the figures of *Epanorthidæ* given on plate i. of the same author's fine work of 1889 [2], several agree very closely with *Cœnolestes*, notably the upper molar of *Epanorthus lemoinei*, drawn fig. 14, which shows very well the quadricuspid three-rooted character of the upper molars of *Cœnolestes*.

The exact geological age of the beds in which *Epanorthus* and its fossil allies have been found is still under discussion, and I do not venture to express an opinion on the subject. Ameghino has called them Middle Eocene, Lydekker Oligocene or early Miocene. Further surveys will no doubt some day settle the point, but it is

[1] "Énumération synoptique des espèces de Mammifères fossiles des formations éocènes de Patagonie," Bol. Ac. Cordoba, xiii. p. 259 (1893).

[2] 'Mamiferos fósiles de la República Argentina.' Text and Atlas, fol.

difficult to believe that the beds are quite so early as Señor Ameghino supposes.

Any lingering doubt which may have existed among Naturalists as to the correctness of Ameghino's reference of the *Epanorthidæ* to the Marsupials (and doubt has been thrown on it) is wholly removed by the study of *Cœnolestes*, which is typically Marsupial in every character.

As to the general classification of the Marsupials, a subject already sufficiently difficult in view of the puzzling possession by the *Peramelidæ* of polyprotodonty combined with syndactyly, *Cœnolestes* apparently only adds to the difficulty, being non-syndactylous like most Polyprotodonts, while it has by dentition nothing to do with them. If anything, however, this fact tends to confirm the tentative opinion expressed in the 'Catalogue of Marsupials,' p. 220, that the primary division of the order should be by dentition, and that syndactyly is a secondary character. Were syndactyly the primary character, the *Epanorthidæ* would be thrown with the *Dasyuridæ* and *Didelphyidæ*, with which they clearly have nothing whatever to do, and separated from what appear to be their nearest allies, the *Phalangeridæ*.

If this view be correct, the Marsupials as a whole might be divided as follows:—

Order MARSUPIALIA.

I. Suborder Diprotodonta.

A. *Non-syndactylous.*—American.

1. Epanorthidæ.

B. *Syndactylous.*—Australian.

2. Phalangeridæ.
3. Phascolomyidæ.
4. Macropodidæ.

II. Suborder Polyprotodonta.

A. *Syndactylous.*—Australian.

5. Peramelidæ.

B. *Non-syndactylous.*—American and Australian.

6. Didelphyidæ.
7. Dasyuridæ.
8. Notoryctidæ.

It is, however, possible that, in spite of the resemblance of the teeth of *Cœnolestes* to those of certain Australian Diprotodonts, the study of further material, including soft parts, skeleton, and milk-teeth, will bring out differences of such importance as to necessitate its subordinal separation from them. In this case the name suggested by Ameghino, Paucituberculata, will be available for the suborder containing *Cœnolestes* and its fossil allies.

Even in that case, however, in view of their many resemblances, it does not seem possible that anything will show that there is no

relationship at all (and only a parallelism) between the American *Epanorthidæ* and the Australian *Phalangeridæ*. The fact, therefore, that no forms at all similar have been found in any part of the Northern Hemisphere, while, with their headquarters in Australia, Diprotodonts have existed in South America at least since early Miocene times, is undeniably very much in favour of the views of those who advocate a former southern connection between Australia and S. America. So long as the *Didelphyidæ* were the only South-American Marsupials known, there was no evidence from the Mammals in favour of, or against, the Southern Continent theory, for Opossums occur fossil half round the Northern Hemisphere, and are, perhaps, merely recent immigrants into S. America. But of late years the strictly Dasyurine relationship of some of the Santa Cruz Polyprotodonts (e. g. *Prothylacinus*) has been recognized, and now to add to this comes the proof that the Patagonian Diprotodonts are really related to the Australian ones; and as both of these groups are in South America of undeniably ancient date, and wholly unknown in any part of the Northern Hemisphere, the case assumes quite a different aspect, and opponents of the theory will probably find it a very difficult matter to explain away the presence of such typically Australian animals in South America.

The systematic information derived from the specimen under examination may be tabulated as follows:—

Order MARSUPIALIA.

Suborder DIPROTODONTA.

Family EPANORTHIDÆ.

Non-syndactylous. Hallux present; not widely opposable.

Incisors $\frac{4}{3}$ (in the recent genus). Lower posterior premolar not hypertrophied.

Genus CÆNOLESTES.

Form as in *Phascologale*. Fifth fore-finger with a nail instead of a claw. Tail long, more or less prehensile. Rudimentary pouch present.

Ante-orbital vacuities present. Palate very imperfect. Premolars $\frac{3}{3}$, the two posterior below large and functional.

1. CÆNOLESTES FULIGINOSUS (Tomes).

Size of a Water-Shrew.
Hab. Ecuador (*L. Fraser*).

2. CÆNOLESTES OBSCURUS, Thos.

Size of a small Rat.
Hab. Bogotá (*G. D. Child*).

P.S., Dec. 31, 1895.—The following remarks on *Cænolestes obscurus* have just been received from Mr. Child:—

"The little animal you speak of is called 'Raton Runcho,' which

means 'Opossum-Rat.' It lives in the high brush-wood, and is supposed to feed on birds' eggs and small birds. It is very rare indeed, and is obtained with much difficulty."

EXPLANATION OF PLATE L.

Fig. 1. *Cœnolestes obscurus.* Outline of skull; natural size.
2, 3, 4. ,, ,, Side, upper, and lower views of skull, twice natural size.
5. ,, ,, Cheek-teeth, side view; magnified 5 times.
6. ,, ,, Upper teeth and half palate. do.
7. ,, ,, Lower do. do.
8. *Decastis columnaris.* Left ramus, lower jaw (after Ameghino).
9. *Parepanorthus minutus.* do. do.

2. On the Sensory and Ampullary Canals of *Chimæra*. By Walter E. Collinge, F.Z.S., Assistant Lecturer and Demonstrator in Zoology and Comparative Anatomy, Mason College, Birmingham.

[Received November 14, 1895.]

(Plates LI.–LIII.)

Contents.

I. Introductory.

Previous references to either the sensory and ampullary canals or cranial nerves of *Chimæra* are few. There are a number of papers—all more or less imperfect—dealing with the central nervous system, dating from Valentin's studies of 1842. Stannius (17) in 1849 described and figured in his classical work the cranial nerves of *Callorhynchus*, a genus closely allied to *Chimæra*. There are also brief references in the text-books of Huxley, Gegenbaur, Wiedersheim, and others. The earliest reference to the canal-system is that given by Leydig (12) in 1851. Hubrecht (11),

Fig 1

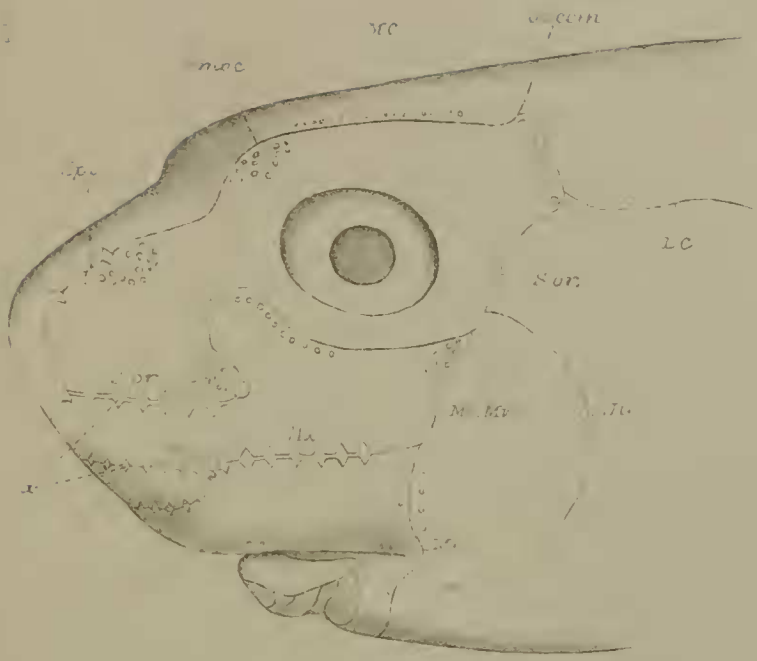


Fig 2

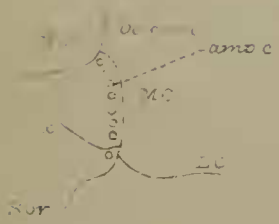


Fig 3

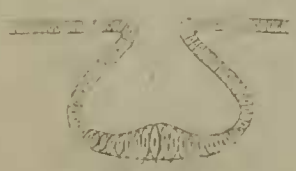
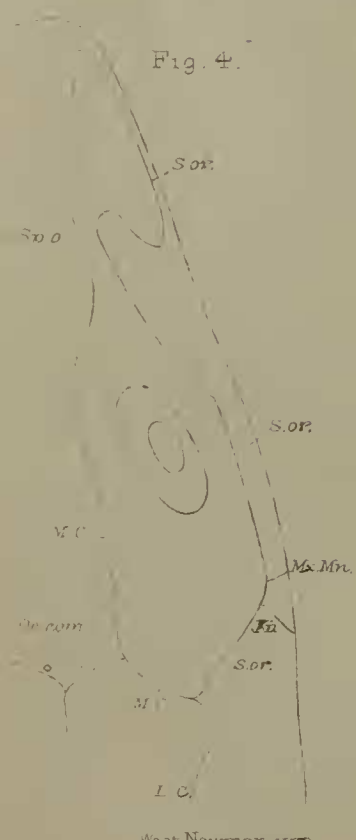


Fig. 4.

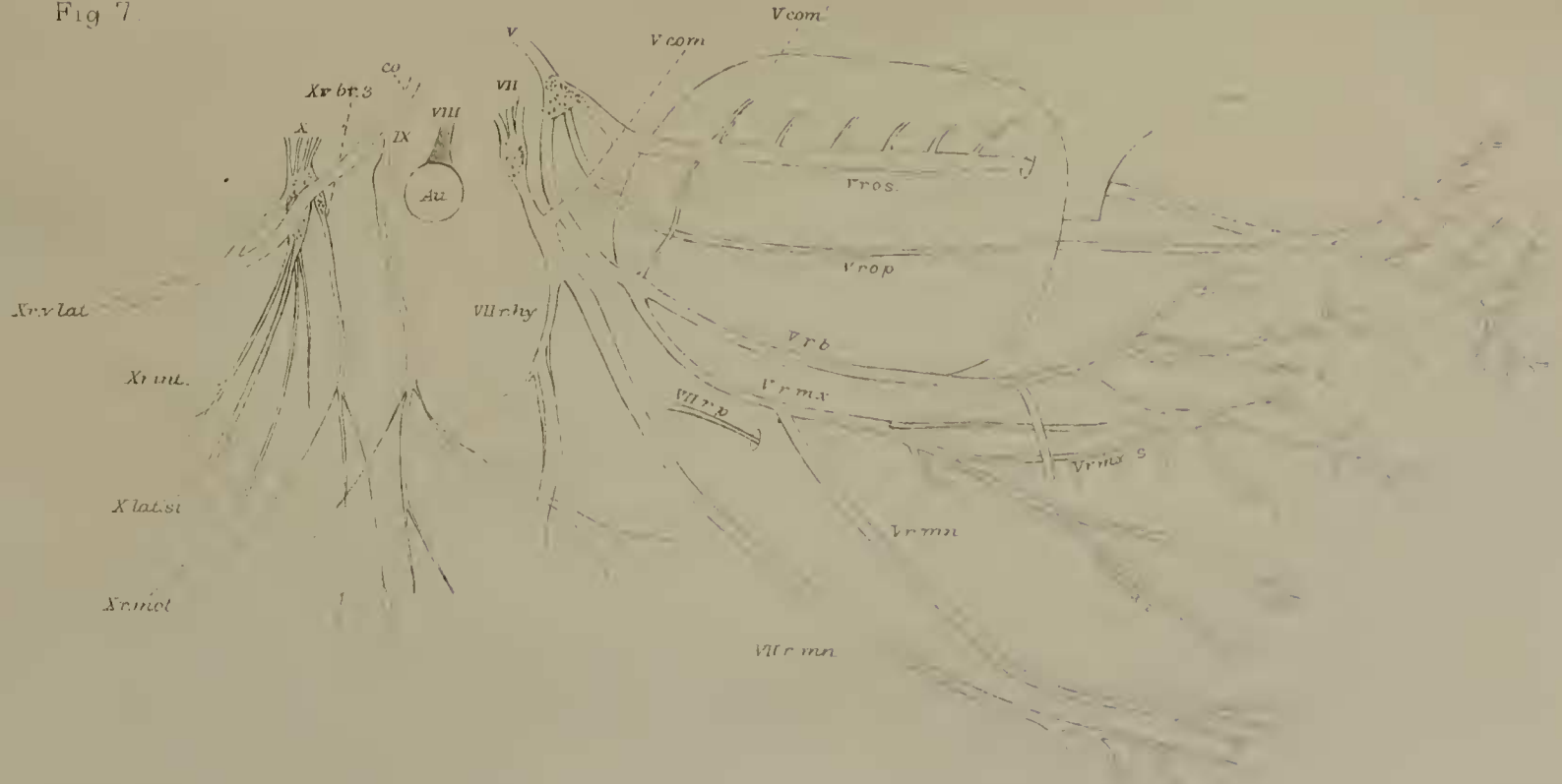


W L Coel ad nat
M P Parker lith.

West Newman imp.

Sensory & ampullary canals of Chimæra.

Fig 7.



W.P.C. del. ad nat.
M.J. Parker lith.

Sensory & ampullary canals of Thinnes

Fig 8.

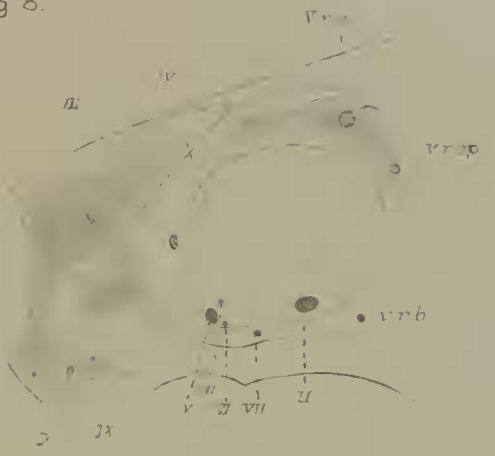
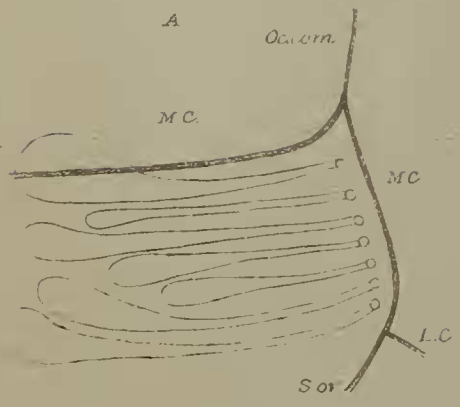


Fig 9



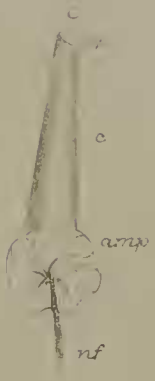


Fig 6.

Fig 10.

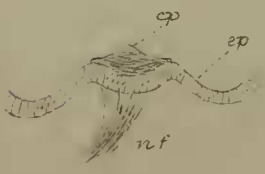
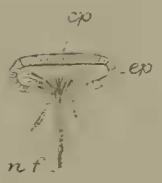


Fig 11



W.E.C. del ad nat.
M.P. Parker lith.

West, Newman imp

Sensory & ampullary canals of Chimæra.

1876, mentions both the canals and cranial nerves in his paper on the skull of the *Holocephali*. Solger (**15**) in 1881 published an account of the development and minute structure of the canals; and later Garman (**9**) described and figured their distribution in both *Chimœra* and *Callorhynchus*.

It was originally my intention to describe at some length the cranial nerves, but lack of better material has prevented me. In the ordinary spirit-preserved material the nerves are not in a fit condition for histological work, and it is only with difficulty that the distribution of the smaller nerves can be traced.

The material was purchased from the Zoological Station at Naples out of funds granted by the Council of the Royal Society, and I take this opportunity of expressing my thanks and acknowledging the assistance they have given me.

My thanks are due to Professor T. W. Bridge, M.A., for his very kind assistance throughout the work, and to Mr. G. A. Boulenger, F.R.S., for his kindness in permitting me to examine the series of young *Chimœra* and *Callorhynchus* in the British Museum collections.

II. The Sensory Canal-System.

1. *General Description.*

In describing the canals and branches I have not adopted the nomenclature of Garman (**9**), as they may be grouped into a similar series as in other fishes, and further, such a nomenclature lends itself better for purposes of comparison. I have given below, on the left side the nomenclature used in this paper, and on the right that used by Garman.

Lateral Canal = Lateral Canal.
Main Canal of the Head = The Cranial Canal (part).
The Occipital Commissure = Aural and Occipital Canals.
The Supra-orbital Branch = The Rostral Canal.
The Sub-orbital Branch = The Orbital and Sub-orbital Canals.
The Maxillo-mandibular Branch = The Angular, Nasal, and Oral Canals.

The lateral canal commences at the end of the long whip-like tail on the lower edge of the muscles, and passes forwards as an open groove to the region of the head, where it is continued as the main canal of the head. This passes forwards forming the supra-orbital branch and in the anterior region joins with the sub-orbital and maxillary branches. Dorsally an occipital commissure is given off from the main canal, and ventrally the sub-orbital branch. From the angle of the sub-orbital branch a short branch is given off—possibly homologous with the operculo-mandibular branch of Ganoids and Teleosts and the hyomandibular branch of Elasmobranchs—which divides into maxillary and mandibular branches; previous to this division there is a short backwardly directed branch, the "jugular canal" of Garman. The maxillo-mandibular

branch divides into maxillary and mandibular divisions; anteriorly the former division meets with the sub-orbital branch, previous to which, however, it gives off a ventral flexure. No short or dendritic branches are given off from either the lateral or main canals or the larger branches. There is also an absence of primitive pores, and the cluster-pores are very few in number. In certain parts of the canals of the head there are large diamond-shaped openings. In these regions the canal is distinctly larger and is supported and protected by a series of cartilages.

2. *Course of the Canals and Branches.*

1. The Lateral Canal commences a few millimetres from the end of the long whip-like prolongation of the tail. Its course lies on the lower side of the muscles of the trunk. Rising slightly dorsally, it passes on to the sides of the body and continues forwards as an open groove to the region of the head. There are no branches of any description passing off from the lateral canal, a feature so characteristic of many Elasmobranchs.

2. The Main Canal of the Head passes directly dorsally, giving off an occipital commissure, and then passing forwards and slightly inwards. Where the main and lateral canals meet with the sub-orbital branch, in some of the specimens examined a small forwardly directed branch was given off (Pl. LI. fig. 2, *x*.).

The Supra-orbital Branch commences where the main canal of the head turns as a forward and slightly outward branch. It passes above the orbit to the tip of the snout, and then makes a sharp turn and meets with the sub-orbital branch (Pl. LI. fig. 1, *Sp.o.*).

The Sub-orbital Branch leaves the main canal of the head at its commencement and passes ventrally, giving off a short jugular branch, and immediately in front of this the maxillo-mandibular branch. The sub-orbital branch continues forwards making a somewhat S-shaped curve and meets with the supra-orbital branch. At the point where these two branches become connected there is a Y-shaped commissure connecting the supra- and sub-orbital branches of either side of the head with the maxillary division of the maxillo-mandibular branch (Pl. LI. fig. 1, *S.or.*).

The Maxillo-mandibular Branch is given off from the sub-orbital branch. The maxillary division passes above the upper jaw, meeting with its fellow of the opposite side. It also gives off dorsal to this, on either side, a short branch which meets with the base of the Y-shaped commissure previously described (Pl. LI. fig. 1, *Mx.* & *Mn.*).

The mandibular and jugular branches are evidently subject to much variation. In most of the specimens I have examined the former do not meet at the symphysis, but terminate at either side of the mouth; in others there is an interrupted canal, as figured by Garman (9. pl. ii. fig. 5). The jugular branch this author figures as passing backwards to the region of the pectoral fin, where it makes a sharp inward curve and runs as an interrupted

canal across the throat, some distance behind the mandibular branch. In all the specimens I have examined this branch runs ventrally and backwards and then forwards, some distance from the region of the fin, in fact quite close to the mandibular branch. This condition was also common to the young examples.

3. The Occipital Commissure passes from the upward portion of the main canal of the head and has a slight backward flexure. Where the two sides meet there is sometimes a short median backwardly directed branch (Pl. LI. fig. 4, *Oc.com.*).

All previous authors are agreed as to the open-grooved nature of the canals in *Chimæra*, as distinct from the tubes found in *Callorhynchus*, and yet the canals do not always persist as open grooves in *Chimæra* or as closed tubes in *Callorhynchus*. In young examples of the former the canals are practically identical with those found in the adult; but in two adult specimens which I examined I noticed a portion of the lateral canal formed a perfect tube, previous to its connection with the main canal of the head, for a distance of about 27 millimetres. In the second specimen the upper portion of the sub-orbital branch was closed for about 12 millimetres. In neither case were there any signs of fusion, so that it is probable that the borders of the groove coalesced in a very early stage, or possibly they arose as distinct isolated tubes and became united with the open groove later, as the isolated portions of the canal do in more specialized fishes. In each case a fine wire was passed through the tube and then a larger one, in order to stretch it before it was finally cut through. In young specimens of *Callorhynchus* short portions of the lateral canal occasionally appear as grooves, the borders of which coalesce at a later stage and form distinct tubes.

3. *Structure and Histology of the Canals.*

The minute structure of the canals and sensory organs is very similar to that described in other fishes—e. g. *Læmargus* and *Raia*, Ewart (6 & 7); *Amia*, Allis (1); *Polyodon* (3),—as a reference to the transverse section of the lateral canal will show (Pl. LI. fig. 5).

In certain portions of the canal-system, viz., the supra- and sub-orbital branches and the maxillary division of the maxillo-mandibular branch, there are a series of diamond-shaped openings, and where these are present the canals are deeper and considerably wider. Encircling these portions are a series of small cartilages having the form of a broken hoop, the two broken ends terminating as bulbous enlargements. Leydig (12) mentions that these cartilages often terminate in dendritic branches, but I have not observed this condition in any of the specimens I have examined, in fact little or no variation was noted in either their size or appearance. They measure 6 millim. in circumference and 1 millim. in breadth (Pl. LIII. fig. 6).

Solger (15) has carefully described the histology and certain modifications of the canals and sense-organs.

4. *Innervation.*

In view of recent researches upon the innervation of the sensory canal-system in fishes, the results obtained in *Chimæra* are exceedingly interesting and quite unlike what I expected.

Until quite recently it was generally assumed that the innervation of the sensory canal-system in fishes proceeded from the trigeminal group of nerves. Ewart (6 & 7), who was the first to carefully investigate this matter in the Elasmobranchii, has shown that the whole system is innervated by the facial complex, ramus oticus and vagus, "the fifth taking no part in innervating the canals." In the Ganoidei, Allis (1) and others have shown that this innervation still obtains, supplemented in *Polyodon* (3) by the trigeminal. In the Teleostei (5) the facial is almost entirely replaced by the trigeminal group; and, judging from comparative smallness of the branches of the facial in *Protopterus* (13) and *Lepidosiren*, we may safely assume that the fifth also innervates the canals in the Dipnoi.

From the nature of the skeleton, the fact that the sensory canals persisted as open grooves, and the presence of ampullary canals, in all three features showing a close affinity with the Elasmobranchs, I expected to find an innervation solely from the facial; but the condition which actually exists is just the reverse, for we find an enormous development of the branches of the trigeminal nerve, particularly of the ramus ophthalmicus superficialis and profundus and ramus buccalis.

Before describing the distribution of the nerves I would point out that Stannius (17), as early as 1849, stated that in *Callorhynchus* certain parts of the canals were innervated by the ramus buccalis and ramus maxillaris superior of the fifth nerve.

The Trigeminal Group consists of the following main branches :—

1. The ramus ophthalmicus superficialis.
2. The ramus ophthalmicus profundus.
3. The ramus buccalis.
4. The ramus maxillaris.
5. The ramus mandibularis.

1. *The ramus ophthalmicus superficialis* is the most dorsal and anterior branch. Previous to entering the orbit it joins with the facial by a commissure (Pl. LII. fig. 7, V. *com.*), and some little distance in front of this joins with the branch which on entering the orbit divides into the ramus buccalis and ramus maxillaris. The superficialis passes across the orbit and through a foramen at the opposite side. In its course across the orbit it gives off six dorsal branches.

2. *The ramus ophthalmicus profundus* passes beneath the two commissures referred to above and below the superficialis. Anterior to the orbit both superficialis and profundus anastomose and then break up into a multitude of fine branches, which innervate the supra-orbital branch of the main sensory canal of the head. (Pl. LII. fig. 7.)

3. *The ramus buccalis* passes over the ventral border of the orbit, and, anterior and slightly ventral to it, anastomoses with the ramus maxillaris superior. (Pl. LII. fig. 7, V. *r.b.*)

4. *The ramus maxillaris* passes slightly beneath the orbit as the ramus maxillo-mandibularis. It divides into maxillary and mandibular branches, and the former again into the ramus maxillaris superior and ramus maxillaris inferior (Pl. LII. fig. 7, V. *r.mx.s.* & V. *r.mx.i.*) The ramus maxillaris, as previously pointed out, anastomoses with the buccalis, the combined branches innervating the sub-orbital branch and Y-shaped commissure of the main sensory canal of the head, while the ramus maxillaris inferior innervates the maxillo-mandibular branch.

5. *The ramus mandibularis* branches from the ramus maxillo-mandibularis previously mentioned, passing above and anterior to the foramen through which the ramus palatinus of the facial passes. It breaks up into a series of fine branches, which innervate the mandibular division of the maxillo-mandibular branch of the main sensory canal.

The Facial Group.—With the exception of the ramus hyoideus, which innervates the jugular canal of Garman, no branches of the facial enter into the innervation of the sensory canal-system. Before passing into the orbit the facial is joined by a commissure from the trigeminal. (Pl. LII. fig. 7, V. *com.*)

The Glossopharyngeal nerve arises in front of the Vagus group and passes behind the auditory capsule, ventral to which it divides into three branches. The most anterior runs beneath the ramus hyoideus of the facial and divides up into a series of fine branches, the middle branch passes to the hyoidean gill-cleft, and the posterior branch skirts the border of the pectoral fin. (Pl. LII. fig. 7, IX.)

Gegenbaur (**10.** p. 518) states that the glossopharyngeal nerve "leaves the cranial cavity in company with the vagus." I cannot corroborate this statement, as it is very distinct from the vagus, and as I have shown (Pl. LIII. fig. 8, IX.) leaves the cranial cavity by a separate foramen. To be quite certain of this I have made four independent dissections, all of which agree with the above description. Since these were finished, I find that Hubrecht (**11**) also comes to a similar conclusion. It seems hardly possible that Gegenbaur could have confounded the branch of the vagus X. *br.* 3 (Pl. LII. fig. 7) with the ninth nerve, and yet this latter is so distinct that it is difficult to see how he could have described it as quoted above.

The Vagus arises by a series of branches (Pl. LII. fig. 7), all of which more or less merge into one in the vagus ganglion. The only portion innervating the sensory canal-system is the vagi lateralis.

The vagi lateralis is the largest branch passing from the vagus ganglion, and is formed by the vagi lateralis proper and a commissure from the facial (?). Superficially this commissure arises about 5 millim. posterior to the roots of the facial. I was unable in the material at my disposal to cut sections so as to definitely settle its

exact relations to the facial. A commissural connection between the trigeminal and vagus is present in *Ceratodus* (*cf.* Sanders, **14**), in *Lepidosiren* (?)[1], and between the facial and vagus in *Protopterus* (*cf.* Pinkus, **13**). The commissure does not join the ganglion but the ramus vagi lateralis at its commencement slightly beyond the ganglion, as in *Ceratodus*, after which it passes beneath the muscles lying close to, and parallel with, the vertebral column (a feature common to *Lepidosiren* also) at the side of the centra and dorsal to the spinal nerves. It passes backwards to almost the end of the whip-like prolongation of the tail, becoming smaller posteriorly. Fine branches pass off ventrally at intervals, the distance varying from five to twelve millimetres—each branch making a ventral curve and passing dorsally again to the lateral canal, there breaking up into a series of fine fibres.

The remaining branches of the vagus are not concerned with the sensory canal-system and call for no special mention.

III. The Ampullary Canals.

1. *General Description.*

One of the most interesting features in *Chimæra* is the presence of groups of Ampullary Canals. They were first described in this fish by Leydig (**12**).

There are in *Chimæra* five main groups on either side of the head, which from their position and for reference may be termed respectively:—

1. *The Occipital group*, situated anterior to that portion of the main canal which leads to the occipital commissure.
2. *The Median group*, a series lying on either side of the mid-dorsal line of the head.
3. *The posterior and anterior Supra-orbital group*, situated below the supra-orbital branch of the main sensory canal of the head.
4. *The posterior and anterior Sub-orbital group*, situated below and above, respectively, the sub-orbital branch of the main canal of the head.
5. *The posterior and anterior Maxillo-mandibular group*, situated above the maxillo-mandibular branch of the main canal of the head.

The posterior and anterior groups of the supra- and sub-orbital groups are often continuous and in some cases one or both were absent, on either one or both sides of the head; in such cases there were slight differences in the branching of the nerve (*cf.* 4) The position of these canals is by no means so constant as in the Elasmobranchs, and isolated lines or clusters are frequently found in other positions than those noted above. They are always distinct from the sensory canal-system.

[1] From the examination I have made of *Lepidosiren* I could not positively say whether this commissure arises from the trigeminal or facial, but, from its position outside the cranial cavity, I think the former.

In all the Elasmobranchs yet investigated the ampullary canals are simple unbranched tubes opening into one or more dilated sacculations; indeed it has been generally acknowledged that this unbranched condition was one of their chief characteristics [1].

Leydig (12. p. 253) says:—"Die fragliche zweite Art der Schleimkanäle erscheint unter der Form zahlreicher, häutiger Röhren, deren eines Ende blind geendigt und mit einem Nervenzweig versorgt ist, und deren anderes Ende mit rundlicher Oeffnung auf der Haut ausmündet. Rücksichtlich des weiteren Baues und der Lage is Folgendes anzugeben. Man kann an jedem solchen Schleimkanal unterscheiden (1) die Ampulle oder das blinde Ende, und (2) die Röhre bis zu ihrer Ausmündung. Die Ampulle (Fig. 1 *a*) stellt im Allgemeinen eine blasenförmige Erweiterung des blinden Endes der Röhre dar. Sie ist breiter als die Röhre, hat bis zu zwei Linien Umfang und lässt schon für das freie Auge ein gebücktetes Aussehen erkennen. Der Raum der Ampulle ist noch dadurch vergrössert, dass sie sich in fünf zipfelförmige Aussackungen (Fig. 1 *b*) forsetzt, welche nach unten und innen convergiren. Die Zipfel, von beiläufig dreieckiger Gestalt mit gleichfalls blasig erweiterten Ecken, kommen vom seitlichen Rande der Ampulle und überragen den Boden derselben. Ihr Gewebe ist eine helle Bindesubstanz, welche nach innen mehr homogen, nach aussen mehr faserig sich zeigt. Ein helles, aus rundlichen Zellen zusammengesetztes Epitel überzieht die innere Oberfläche. An die Ampulle herantritt ein Nervenstammchen (Fig. 1 *c*), das ungefähr zwölf Primitivfasern zählt, sie durchsetzen die Ampulle an ihrem von den Zipfeln überragten blinden Boden, weichen strahlig auseinander und lassen, da der Boden der Ampulle breit und hell ist, Theilungen der Nervenfibrillen in zwei und drei Aeste häufig und schön sehen. Ueber ihr weiteres Verhalten habe ich nur so viel ermitteln können, dass sie nach und nach feiner geworden, sich in die Zellenmasse der Ampulle und ihrer Aussackungen verlieren." Further histological detail follows and then an account of the contents of the canals. "Noch ist zu bemerken," continues Leydig, "dass die Röhre gewöhnlich gegen ihre Ausmündung hin ihren Durchmesser vergrössert und bis zu zwei Linien weit wird." This statement I have been unable to verify, for I find all the canals become smaller as they approach the pore.

The position and relations of the Ampullary canals to the Sensory canals is noted, and the histology of the capsule enclosing the groups of ampullæ described as follows:—

"Die Ampullen aber sind zu ihrem Schutze in eine eigene Kapsel eingeschlossen, welche in der Mitte der kegelförmig vorspringenden Schnauze liegt und hauptsächlich deren starke Hervorragung bedingt. Die Kapsel hat eine konische Gestalt, ist gegen $1\frac{1}{2}$ Zoll hoch und 1 Zoll breit, ihre Wand ist gitterförmig durchbrochen und besteht aus Bindegewebe, dem nur vereinzelte

[1] Ewart (6. p. 60) says, "These radiating canals, however, though often running for a considerable distance side by side, never communicate with each other, nor do they give off tubules or branches."

elastische Fasern beigemischt sind. Mitten durch die Kapsel geht noch ein weisser, aus Bindegewebe gefertigter, 1½ Linien dicker, fester Strang, der von einem knorpeligen Fortsatz des Kopfknorpels kommt und zur Befestigung und Erhaltung der Form der Kapsel wesentlich beiträgt. Die bezeichnete Kapsel ist angefüllt mit einer hellen Gallertmasse, und in diese eingebettet liegen die Ampullen der Schleimkanäle. In der Gallertmasse sieht man ausser Kernen noch Bindegewebsmaschen und elastische, oft in weiten Bogen isolirt verlaufende Fasern, welche alle sowohl mit der Wand der Ampullenkapsel als auch mit den Ampullen selber in Verbindung stehen, und die Befestigung derselben innerhalb der Gallerte sichern."

2. *Structure and Varieties.*

I have quoted Leydig at some length, for his account is the first and only one that makes any pretence at detail. Judging from Leydig's description and figure, he only met with one form of canal, whereas there are three distinct types.

In the occipital group the number of pores varies from seven to eleven, each leads into a long tube or canal which widens out into a sac-like base (Pl. LIII. fig. 9, *a*), the ampulla being ill-defined. In some cases where the pores of the canals are in a row and the canals or tubes run parallel to each other, some are longer than others, the length from the pore to the base of the canal varying as follows :—

Specimen	No. 1. millim.	No. 2. millim.	No. 3. millim.	No. 4. millim.
Pore 1	37	35	34	30
„ 2	25	22	20	18
„ 3	34	30	20	29
„ 4	25	21	28	18
„ 5	20	18	18	29
„ 6	30	29	28	20
„ 7	33	35	29	26

The measurements were made on four different specimens and of the first seven pores (Pl. LIII. fig. 9, *a*).

In the supra- and sub-orbital groups the pores are more closely grouped. Each leads into a narrow tube which passes downwards and with its fellows OPENS INTO A SINGLE WIDE TUBE; this continues for a short distance and then terminates in a spongy mass of ampullæ (Pl. LIII. fig. 9, *b*). The whole of the spongy mass is enclosed in an ill-defined connective-tissue capsule. In the maxillo-mandibular groups the canals approach more nearly to those described and figured by Leydig, and it seems very probable that he examined only those in this region and in the region of the Y-shaped commissure.

Thus in *Chimæra* it will be seen that there are three types of ampullary canals, viz. :—(1) A simple unbranched tube which

gradually becomes wider as it leaves the surface and finally expands into an ill-defined ampulla (Pl. LIII. fig. 9, *a*); (2) a series of tubes much smaller than number 1, all of which lead into a common tube, considerably wider, from which numerous ampullæ are given off (Pl. LIII. fig. 9, *b*); and (3) a simple unbranched tube, at the base of which are a series of well-defined ampullæ (Pl. LIII. fig. 9, *c*).

It is possible that ampullary canals like numbers 1 and 2 may yet be found in the Elasmobranchii: a careful investigation of the system in the Batoidei is much to be desired.

The minute structure is almost identical with that of the Elasmobranchii, the chief difference being, that in the sensory organ at the base of the ampulla, in *Chimæra*, the epithelium-cells of the "Centralplatte" form a concavity, in which rests the "cupula terminalis" of Solger (Pl. LIII. fig. 10); whereas in the Elasmobranchii these cells are arranged as a flat plate as shown in fig. 11. Solger was the first to describe this difference.

3. *Innervation.*

The ampullary canals are all innervated by branches of the trigeminal[1], the branches which innervate the sensory organs of the sensory canal-system giving off branches to the ampullæ, as shown below:—

Median group. Posterior and anterior Supra-orbital group.	Supplied by dorsal branches of the ramus ophthalmicus superficialis (V.).
Posterior and anterior Sub-orbital group.	Supplied by the ramus buccalis and maxillaris superior (V.).
Posterior and anterior Maxillo-mandibular group.	The ramus maxillaris inferior supplies these. Where there are a few scattered ampullary canals in the mandibular region, branches of the ramus mandibularis (V.) innervate them.

IV. Summary and Conclusion.

1. In *Chimæra* the canals and branches persist as open grooves, agreeing in this feature with the condition which obtains in the Elasmobranchii; variations, however, sometimes occur.

2. Unlike the condition found in many Elasmobranchii, in *Chimæra* there are no fine dendritic branches from either the lateral or main canal, or from any of the branches of the latter.

3. Ampullary canals are present, three distinct types being found in different regions of the head. Their number, position, and even structure is subject to much variation. *They are all innervated by branches of the trigeminal nerve.*

4. The innervation of the sensory canals &c. proceeds from

[1] "It is worthy of note that all the groups of ampullæ—superficial ophthalmic, inner and outer buccal, hyoid and mandibular—are supplied by dorsal branches of the facial" (Ewart, 6. p. 81).

the trigeminal facial and vagus. It may conveniently be expressed as follows :—

TRIGEMINAL.

Ramus ophthalmicus superficialis.	Innervate the main canal of the head and the supra-orbital branch.
Ramus ophthalmicus profundus.	
Ramus buccalis.	Innervate the sub-orbital branch and the Y-shaped commissure of the main canal of the head.
Ramus maxillaris superior.	
Ramus maxillaris inferior.....	Innervates the maxillary division of the maxillo-mandibular branch.
Ramus mandibularis.....	Innervates the mandibular division of the maxillo-mandibular branch.

FACIAL.

Ramus hyoideus.....	Innervates the jugular canal of Garman.

VAGUS.

Ramus vagi lateralis.....	Innervates the lateral canal.

It will thus be seen *that the facial nerve is almost entirely replaced by the trigeminal*, not unlike the condition I have previously described in the Physostomous Teleostei (**5**).

5. The vagus arises distinct from the glossopharyngeal nerve, and leaves the skull by a separate foramen. The branching is not unlike that figured and described by Pinkus (**13**) in *Protopterus*.

6. There is a commissural connection between the vagus and facial (? trigeminal), probably homologous with that which obtains in *Ceratodus*, *Protopterus*, and *Lepidosiren*.

7. The combined vagi lateralis and commissure run posteriorly quite close to the vertebral column, as in *Lepidosiren*.

8. In the form of the canals and branches, and the possession of ampullary canals, the system resembles that found in the Elasmobranchii ; on the other hand, in the innervation it more nearly resembles the condition found in the Teleostei and Dipnoi.

9. Hitherto most zoologists have classed the Holocephali with the Elasmobranchii ; Huxley, Gegenbaur, and a few others, however, have preferred to regard them as a distinct class. The results obtained by an examination of the innervation of the sensory canal-system strengthen, I think, the grounds for this separation.

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I.

1. ELASMO

EOSTEOIDEI.

General Feature
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They are partly
Heptabranchias
lachus, *Heterodont*

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Branches.

by scales, and pass through
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Occipital commissu

ure present, also in frontals
d in ethmoid (*Polypterus*).

Branching genera
fine dendritic b
the Lateral can
canals and bra
, ventral surface, e

ng profuse in *Lepidosteus*.
m the Lateral canal.

Cluster and primiti

tive pores usually few.

Accessory sensory
canal-system.

ory organs.

Inn

nervation.

1. *Lateral Canal.*

X. Vagi lateralis.

2. *Main Canal.*
ganglion and

X. Branch from vagi
Glossopharyngeal, and V.

3. *Occipital Comm*
ganglion.

missure. Branch from X.

4. *Hyo-mandibula*
hyo-mandibul

ibular branch. VII. Ramus
laris.

5. *Supra-orbital b*
thalmicus sup

branch. VII. Ramus oph-
erficialis.

6. *Sub-orbital bra*

nch. VII. Ramus buccalis.

The Glossophary
does not enter i
canal-system.

IV. TELEOSTEI.

General Features of the Canals and Branches.

Canals sometimes dermal (*Amiurus*) or protected by scales or drain-pipe-like canal-bones, or represented only by sensory organs, or both absent (*Ostracions*, *Centriscus*). In some cases (*Coris*) the canal passes through modified scales only. In *Exocetus* the Lateral canal passes dorsal to the pelvic fin and ventral to the pectoral, the canals of either side converging ventrally. In *Conger*, *Solea*, &c., saccular dilatations pass off from the canals. In the deep-sea Teleosts, e. g. *Cottus bathybius*, *Liparis micropus*, *Lycodes muræna*, &c., the canals are in the form of open grooves. In some Pleuronectidæ 2 or 3 lateral canals. In *Mugil* 9 are present (*M'Donnell*).

Occipital commissure nearly always present, sometimes one in frontal region.

Dendritic branching occasionally present.

Cluster and primitive pores few, where present.

Accessory sensory organs sometimes occur (*Amiurus*, &c.).

Innervation.

1. *Lateral Canal.* X. Vagi lateralis. In the Ostracions the vagi lateralis is more or less rudimentary (*Günther*).

2. *Main Canal.* V. Ramus ophthalmicus superficialis, the ramus oticus sometimes (*Amiurus*); the glossopharyngeal may either innervate a portion or the whole. The vagus may or may not by anterior branches supply the initial portion of the main canal.

3. *Occipital Commissure.* Glossopharyngeal.

4. *Operculo-mandibular branch.* VII. Ramus hyo-mandibularis. In *Amiurus*, ramus oticus and ramus mandibularis (V.).

5. *Supra-orbital branch.* V. Ramus ophthalmicus superficialis.

6. *Sub-orbital branch.* V. Ramus buccalis and ramus maxillaris.

(To face p. 888.

V. Comparison with the Elasmobranchii, Ganoidei, and Teleostei.

I. ELASMOBRANCHII.	II. HOLOCEPHALI	III. GANOIDEI		IV. TELEOSTEI.
		a. Selachoidei.	b. Teleostomi.	
General Features of the Canals and Branches	General Features of the Canals and Ampullæ	General Features of the Canals and Branches.	General Features of the Canals and Branches.	General Features of the Canals and Branches
The canals usually have the form of an open groove and are partly dermal. They are partly or wholly tubular in *Heptanchus cinereus*, *maculatus*, *Chlamydoselachus*, *Heterodontus philippi*, &c.	The canals persist either as open grooves (*Chimæra*) or as tubes (*Callorhynchus*), in certain regions they are protected by cartilages.	The canals in some cases are largely dermal (*Polypodus*, *Psephurus*). In all cases dermal pipe-like canal bones are present.	Canals protected by scales, and pass through bones of the head.	Canals sometimes dermal (external or protected by scales or dermal-pipe-like canal-bones, or represented only by sensory organs, or both absent (*Gadus cæruleus*, *Gadiformes*). In some cases (*Uranoscopus*) the canal passes through modified scales only. In *Exocœtus* the Lateral canal passes dorsad to the pelvic fin and ventral to the pectoral, the canals of either side converging ventrally. In *Cyprinus*, *Salmo*, &c., saccular dilatations pass off from the canals. In the deep-sea Teleosts, e. g. *Cetostoma barbatum*, *Liparis montagui*, *Lipodes varians*, &c., the canals are in the form of open grooves. In some Pleuronectidæ 2 or 3 lateral canals. In *Mugil* 0 are present (*M'Donald*).
Occipital commissure usually present.	Occipital commissure present, and one to the nasal region.	Occipital commissure present (*Acipenser*), sometimes imperfect (*Polypodus*).	Occipital commissure present also in frontals (*Lepidosteus*) and in lateral (*Polypterus*).	Occipital commissure nearly always present, sometimes one in frontal region.
Branching generally profuse. Numerous fine dendritic branches given off from the Lateral canal. In some cases the canals and branches are also on the ventral surface, e.g. *Torpedo*, *Sarcine*.	No fins dendritic branching. No branches from the Lateral canal.	Slight branching. Branches from the Lateral canal.	Feeble branching profuse in *Lepidosteus*. No branches from the Lateral canal.	Dendritic branching occasionally present.
Cluster and primitive pores numerous.	Cluster-pores few. No primitive pores.	Cluster and primitive pores in abundance.	Cluster and primitive pores usually few.	Cluster and primitive pores few, where present.
Accessory sensory organs distinct from the canal-system.	No accessory sensory organs.	Accessory sensory organs present.	No accessory sensory organs.	Accessory sensory organs sometimes occur (*Amiurus*, &c.)
Innervation.	**Innervation.**	**Innervation.**	**Innervation.**	**Innervation.**
1. *Lateral Cranial* X. Vagi lateralis.	1. *Lateral Cranial* X. Vagi lateralis, which is joined by a communicans from the lateral VII [or trigeminal (V.)].	1. *Lateral Canal*. X. Vagi lateralis.	1. *Lateral Canal* X. Vagi lateralis.	1. *Lateral Canal* X. Vagi lateralis. In the Pleuronectes the vagi lateralis is more or less rudimentary (*Goodsir*).
2. *Main Canal*. Branches from the vagus ganglion and ramus otieus.	2. *Main Canal*. V Ramus ophthalmicus superficialis.	2. *Main Canal*. V Ramus otieus.	2 *Main Canal* X Branch from vagi lateralis, IX. Glossopharyngeal, and V Ramus otieus.	2. *Main Canal* V Ramus ophthalmicus superficialis, the ramus otieus sometimes (*Amiurus*), the glossopharyngeal may either intercalate a portion or the whole. The vagus may or may not by anterior branches supply the initial portion of the main canal.
Occipital Commissure. Branch from vagus ganglion.	3. *Occipital Commissure*. Not traced.	3 *Occipital Commissure*. Branch from X. Vagi lateralis.	3. *Occipital Commissure*. Branch from X. Vagi lateralis.	3. *Occipital Commissure*. Glossopharyngeal.
4 *Hyo-mandibular branch*. VII Ramus hyo-mandibularis.	4 *Maxillo-mandibular branch* V Ramus maxillaris inferior and the ramus mandibularis.	4. *Hyo-mandibular branch* VII Ramus opercularis superficialis.	4 *Operculo-mandibular branch* VII. Ramus hyo-mandibularis.	4 *Operculo-mandibular branch*. VII Ramus hyo-mandibularis. In *Amiurus*, ramus otieus and ramus mandibularis (V.).
Supra-orbital branch. VII Ramus ophthalmicus superficialis.	5 *Supra-orbital branch* V Ramus ophthalmicus superficialis and profundus.	5 *Supra-orbital branch* | VII Ramus buccalis.	5. *Supra-orbital branch* VII. Ramus ophthalmicus superficialis.	5. *Supra-orbital branch*. V Ramus ophthalmicus superficialis.
6 *Suborbital branch*. VII. Ramus buccalis.	6. *Sub-postal branch*. V Ramus buccalis and ramus maxillaris superior.	6. *Sub-orbital branch*	6. *Sub-orbital branch*. VII. Ramus buccalis.	6. *Sub-orbital branch*. V Ramus buccalis and ramus maxillaris.
The Glosso-pharyngeal according to Ewart does not enter into the innervation of the canal system.	The Glosso-pharyngeal does not enter into the innervation of the canal system. The ramus hyoideus VII innervates the jugular canal.	The ramus mandibularis V innervates primitive pores in the region of the maxilla.		

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EXPLANATION OF PLATES LI.–LIII.

Reference Letters.

a. Ampulla.
Amp.C. Ampullary Canals.
Au. Auditory capsule.
Co. Commissure from 5th or 7th nerve to the ramus vagi lateralis.
Ju. Jugular Canal.
L.C. Lateral Canal.
M. Mouth.
M.C. Main Canal.
Mn. Mandibular division of the Maxillo-mandibular branch.
Mx. Maxillary division of the Maxillo-mandibular branch.
Mx.Mn. Maxillo-mandibular branch.
Oc.com. Occipital commissure.
S.or. Sub-orbital branch of the main sensory canal.

Sp.o. Supra-orbital branch of the main sensory canal.
II. Optic foramen.
III. Oculo-motor nerve.
IV. Pathetic nerve.
V. *r.b.* Ramus buccalis.—Trigeminal.
V. *com.* Commissure between the facial and trigeminal nerve.
V. *com.*[1] Commissure between the ramus ophthalmicus superficialis and the ramus buccalis.
V. *r.mn.* Ramus mandibularis.—Trigeminal.
V. *r.mx.* Ramus maxillaris.—Trigeminal.
V. *r.mx.i.* Ramus maxillaris inferior.—Trigeminal.
V. *r.mx.s.* Ramus maxillaris superior.—Trigeminal.
V. *r.o.p.* Ramus ophthalmicus profundus.—Trigeminal.
V. *r.o.s.* Ramus ophthalmicus superficialis.—Trigeminal.
VI. Abducent nerve.
VII. Facial nerve.
VII. *r.hy.* Ramus hyoideus.—Facial.
VII. *r.mn.* Ramus mandibularis.—Facial.
VII. *r.p.* Ramus palatinus.—Facial.
VIII. Auditory nerve.
IX. Glossopharyngeal nerve.
X. Vagus.
X. *r.br.* 3. Branchial nerve.
X. *r.int.* Ramus intestinalis.
X. *r.lat.s.i.* Ramus lateralis superficialis inferior.
X. *r.mot.* Motor branches from Vagus ganglion.
X. *r.v.lat.* Ramus vagi lateralis.

Fig. 1. Lateral view of the head of *Chimæra*, showing the distribution of the sensory and ampullary canal-system.
2. Portion of the canal-system showing variation. The branch *x* arising from the main canal of the head.
3. Anterior view of the head of *Chimæra*, showing the connection of the supra- and sub-orbital branches, and the Y-shaped commissure connecting the same with the maxillo-mandibular branch.
4. Diagrammatic view of the dorsal surface of the head of *Chimæra*, showing the main canal and branches, and the occipital commissure.
5. Transverse section through the lateral canal. *c.* Cavity. *n.f.* Nerve-fibre.
6. Cartilaginous hoops from the sub-orbital branch of the main sensory canal.
7. Diagrammatic view of the distribution of the cranial nerves.
8. Lateral view of the posterior portion of the cranium of *Chimæra*, showing the foramina for the exit of the cranial nerves.
9. Ampullary canals from the head of *Chimæra*:—*a*, from the occipital group; *b*, from the sub-orbital group; *c*, from the maxillary group. *amp.* Ampulla. *c.* Canal. *n.f.* Nerve-fibre. *p.* Pore.
10. Sensory organ from the base of an ampullary canal in *Chimæra*.
11. The same from an ampullary canal in *Scyllium*. *cp.* Cupola. *ep.* Epithelium. *n.f.* Nerve-fibre.

3. Note in Correction of a Paper on Colour-variation in Flat-fishes. By W. Bateson, M.A., F.R.S., Fellow of St. John's College, Cambridge.

[Received December 11, 1895.]

In the 'Proceedings' of this Society, 1894, p. 246, I published an account of an abnormal Brill (*Rhombus lævis*) having a series of dark spots along the dorsal and ventral borders of the body on the "blind" side. In commenting on this case, stress was laid on the fact that the corresponding parts of the dorsal and ventral borders had thus varied similarly and simultaneously. At the time I was

under the impression that the variation observed was a sudden appearance of a character not otherwise met with in Flat-fishes; but since the publication of the paper Professor W. C. McIntosh has informed me that flat-fishes of some species in the ordinary course of development, while swimming on edge, go through a stage in which they are marked on both sides with a row of dorsal and ventral spots placed just as in my specimen. He has referred me to his paper in Proc. Roy. Inst. 1889, xii. p. 396, where examples of such larval fishes are figured. I am further indebted to Prof. McIntosh for a specimen showing this condition, and similar specimens were also shown to me by Mr. E. W. L. Holt.

My case of variation is therefore an example of a persistence of larval coloration, and not of the appearance of a new character. It is consequently much less important than I imagined, though the comment respecting the similarity and simultaneity of the variation of the two borders still applies.

4. On the Orthoptera of the Sandwich Islands. By Herr Brunner v. Wattenwyl [1].

[Received November 19, 1895.]

The Orthopterological Fauna of the Sandwich Islands is little known, so that all collections made in them ought to produce novelties. Mr. Aug. de Bormans, in 1882, published descriptions of 17 species. The collection made by Mr. R. C. L. Perkins with much labour in 1894 contains examples of 23 species, which are only in part identical with those of the first collection.

If we combine the results of these two explorations, we must confirm the conclusion already arrived at by Mr. de Bormans that this fauna is distinguished by its poverty, and notably by the absence of the *Mantodea* and *Phasmodea*. The *Acridiodea* are represented by only a single species.

With the exception of some cosmopolitan species, the fauna is composed of species already known from the Australian Archipelago and of autochthonous species that are allied to the others. The genus *Brachymetopa*, represented by three or four species, is peculiar to the Hawaiian Archipelago. It is a member of the group *Conocephalini*.

In the family *Gryllodea* the two new species of *Paratrigonidium* are remarkable. This genus, hitherto, has only been recorded from Asia.

A new genus, *Prognathogryllus*, consists of two anomalous forms.

Finally we meet with two species which evidently are recent importations. The first of these is *Oxya velox*, Fab., the unique representative of the *Acridiodea*, which is very common in the

[1] Communicated by Dr. D. Sharp, F.Z.S., on behalf of the Committee for investigating the Fauna of the Sandwich Islands.

Malay Islands, and the second a *Xiphidium*, which I cannot distinguish from a European species.

Dermaptera.

1. Anisolabis littorea, White.

Forcinella littorea, Dohrn, Stett. ent. Zeit. xxv. p. 287.

Oahu; Haleakala, Maui (*Borm.*).

2. Anisolabis maritima, Bon.

Anisolabis maritima, Brunner, Prodr. p. 9.

Maui (*Borm.*).

3. Anisolabis pacifica, Erichs.

Koele, Lanai; Waimea, Kauai, 3000 ft. (*Perkins*).

4. Anisolabis annulipes, Luc.

Molokai, 3000–4000 ft. (*Perkins*).

5. Labia pygidiata, Dubr.

Labia pygidiata, Dubrony, Ann. Mus. Civ. Genov. xiv. p. 364.

Oahu (*Borm.*); Kona, Hawaii (*Perkins*).

6. Chelisoches morio, Fab.

Lobophora morio, Dohrn, Stett. ent. Zeit. xxvi. p. 71.

Common in the whole archipelago (*Borm.*); Pelekunu, Molokai (*Perkins*).

7. Forficula hawaiensis, Borm.

Forficula hawaiensis, de Bormans, Ann. Mus. Civ. Genov. xviii. p. 341.

Several islands (*Borm.*).

Blattodea.

8. Phyllodromia hieroglyphica, Brun.

Phyllodromia hieroglyphica, Brun. Nouv. Syst. Blattaires, p. 105.

Oahu (*Perkins*, *Borm.*); Lanai, Kauai (*Perkins*).

9. Phyllodromia obtusata, sp. n.

Colore testaceo. Caput latum, testaceum unicolor. Antennæ fuscæ. Pronotum unicolor vel disco leviter fusco-delineato, latum, antice et postice truncatum. Elytra abdomen haud superantia, unicoloria. Alæ apice obtusæ, leviter infumatæ, vena ulnari simpliciter furcata. Femora antica subtus submutica, apicem versus spinulis minimis alineatis armata. Abdomen fuscum. Lamina supra-analis ♀ triangularis, apice triangulariter emarginata. Lamina subgenitalis ♀ late triangularis. ♀.

	♀.
Long. corporis	7·5–9·5 millim.
,, pronoti	2·2–2·5
Lat. pronoti	3·5–3·7
Long. elytrorum ..	5·6–7

Kona &c., Hawaii (*Perkins*).

10. Stylopyga decorata, Brun.

Stylopyga decorata, Brun. Nouv. Syst. Blattaires, p. 224.
Honolulu, in the houses (*Borm.*).

11. Methana ligata, Brun.

Methana ligata, Brun. Nouv. Syst. Blattaires, p. 234.
Honolulu, in the houses (*Borm.*).

12. Periplaneta americana, L.

Honolulu (*Borm.*).

13. Eleutheroda dytiscoides, Serv.

Eleutheroda dytiscoides, Brun. Nouv. Syst. Blattaires, p. 265.
Honolulu (*Perkins*); Honolulu, in the wall-trees (*Borm.*).

14. Leucophæa surinamensis, Fab.

Leucophæa surinamensis, Brun. Nouv. Syst. Blattaires, p. 278.
Environs of Honolulu, under stones (*Borm.*); Maui, Wailuku (*Perkins*).

15. Oniscosoma pallida, Brun.

Oniscosoma pallida, Brun. Nouv. Syst. Blattaires, p. 301.
Haleakala, Maui, 650 m. (*Borm.*).

16. Euthyrrapha pacifica, Coqueb.

Euthyrrapha pacifica, Brun. Nouv. Syst. Blattaires, p. 343.
Honolulu (*Borm.*); Kaawaloa, Hawaii (*Perkins*).

Acridiodea.

17. Oxya velox, Fab.

Oxya velox, Brun. Rév. Syst. p. 152.
Waianae Mts., Oahu, 1600 ft., April (*Perkins*).

Locustodea.

18. Elimæa appendiculata, Brun.

Elimæa appendiculata, Brun. Monogr. Phaneropt. p. 101.
Honolulu (*Borm.*, *Perkins*).

19. Brachymetopa discolor, Redtenb.

Brachymetopa discolor, Redtenb. Verh. z.-b. Ges. Wien, 1891, p. 431.

Honolulu (*Redtenb.*); Kaala Mts., Waianae Mts., Oahu (*Perkins*).

20. Brachymetopa blackburni, Borm.

Brachymetopa blackburni, Redtenb. l. c. p. 431.

In nearly all the Islands, on the forest trees (*Borm.*).

21. Brachymetopa deplanata, sp. n.

Viridis vel griseo-testacea. Fastigium verticis æque latum ac longum, apice rotundatum, superne deplanatum. Antennæ unicolores viridi-flavæ. Frons viridis. Labrum cum mandibulis pallide ferrugineum. Elytra variabilia, abdominis longitudine vel medium ejus haud superantia, tympano in elytro sinistro ♂ subopaco. Pedes unicolores. ♂ ♀.

	♂.	♀.
Long. corporis.....	19	21 millim.
,, fastigii vert.	1·1–1·5	1·9
,, pronoti	5·5–5·6	5·9
,, elytrorum	6–9·5	9
,, femor. post.	10–11·5	12·5
,, ovipositoris	....	11·5

Lanai, 2000 ft.; Kalae, 4000 ft.; Molokai; Makaweli, 3000 ft., Kauai (*Perkins*).

22. Brachymetopa nitida, sp. n.

Viridis vel griseo-testacea. Fastigium verticis angustius quam longius. Antennæ unicolores virides. Frons viridis. Labrum pallidum. Mandibulæ subtotæ nigræ. Elytra in ♂ abdomen æquantia, in ♀ medium ejus superantia, tympano in elytro sinistro ♂ nitido. Femora omnia in apice ipso nigro-bipunctata. ♂ ♀.

	♂.	♀.
Long. corporis.....	21	22·5 millim.
,, fastigii vert. ..	1·2	1·2
,, pronoti	5·7	6·4
,, elytrorum ..	12	13
,, femor. post. ..	13	14·5
,, ovipositoris ..	..	11·5

Kona, Mauna Loa, 2000 ft., Hawaii (*Perkins*).

23. Xiphidium fuscum, Fab.

Xiphidium fuscum, Redtenb. Verh. z.-b. Ges. Wien, 1891, p. 508.

Pauoa, Oahu, Dec. 1892 (*Perkins*).

Gryllodea.

24. Gryllus innotabilis, Walk.

Gryllus innotabilis, Sauss. Mél. Orth., V. Gryllides, p. 336.

In nearly all the Islands of the Archipelago (*Borm.*); Kalae, Molokai; Waianae, Oahu; Kona, 2000 ft., Hawaii (*Perkins*).

25. Gryllodes poeyi, Sauss.

Gryllodes poeyi, Sauss. Mél. Orth., V. Gryllides, p. 387.
Waianae Mts., Oahu; Waimea Mts., 3000 ft., Kauai (*Perkins*).

26. Paratrigonidium pacificum (Scudd.).

Trigonidium pacificum, Scudd. Proc. Bost. Soc. N. H. xii. p. 139 (1868).

The description given by Scudder being very incomplete, I give a new diagnosis of this species, which comes into my genus *Paratrigonidium* (Révision du syst. des Orth. p. 208).

Colore castaneo. Frons pallide signata. Antennæ fuscæ. Pronotum pilis fuscis raris obsitum. Elytra apicem abdominis attingentia, in ♂ plana, tympano venulis indistinctis toto rugosa. Elytra in ♀ fornicata, cornea, venis parallelis rectis necnon venis spuriis intercalatis instructa. Pedes fusco et pallide variegati. Tibiæ anticæ in latere externo tympano minimo instructæ. ♂ ♀.

	♂.	♀.	
Long. corporis	6	7	millim.
,, pronoti	1·6	1·5	
,, elytrorum ..	4·4	4·5	
,, femor. post..	5	5·8	
,, ovipositoris..	..	3	

Environs of Honolulu (*Borm.*); Waianae, Oahu; Kauai; Lanai; Molokai; Kona, Hawaii (*Perkins*).

27. Paratrigonidium atroferrugineum, sp. n.

Colore atro et ferrugineo. Caput cum pronoto atrum. Antennæ, excepto articulo basali, cum palpis ferrugineæ. Elytra in ♂ ferruginea, plana, medio atra, in ♀ unicoloria ferruginea. Femora omnia atra, apice ferruginea. Tibiæ ferrugineæ. Ovipositor ater. ♂ ♀.

	♂.	♀.	
Long. corporis	7·5	6·8	millim.
,, pronoti	1·5	1·6	
,, elytrorum ..	4·6	4	
,, femor. post..	4·3	4.5	
,, ovipositoris..	..	3	

Molokai, 4000 ft. (*Perkins*).

I am obliged to create a new genus for two species peculiar to the Hawaiian Archipelago. This genus belongs to the *Podoscirtes* group, and is distinguished from all the other genera of this group

by the more porrect head, so that the front forms a very obtuse angle with the vertex. This extraordinary form approaches most nearly to the genus *Stenogryllus* of Saussure.

PROGNATHOGRYLLUS, gen. nov. ex tribu Podoscirtium.

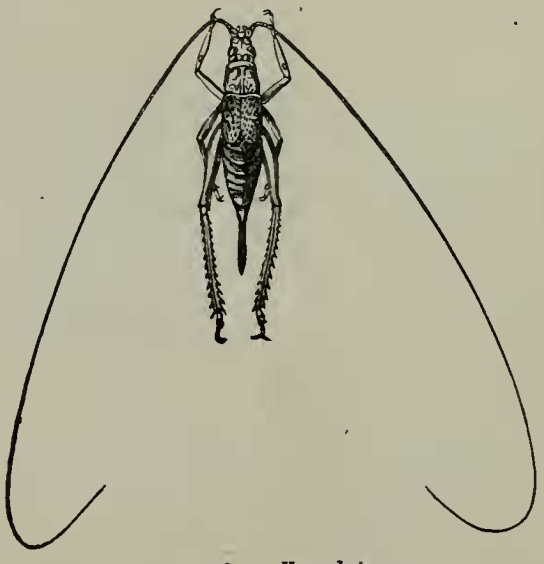
Corpus gracile. Caput prognathum. Vertex valde depressus, cum fronte angulum obtusissimum formans. Frons inter antennas compressa. Antennæ longissimæ, fortiores. Pronotum elongatum, planum, latere vix deflexum. Elytra valde abbreviata vel nulla. Alæ nullæ. Femora postica a basi sensim graciliscentia. Tibiæ anticæ muticæ, tympano nullo instructæ. Tibiæ posticæ superne utrinque serrulatæ vel in latere interno spinalis longioribus instructæ; calcaribus tribus externis brevissimis, duobus internis majoribus, superiore duplo longiore quam inferius. Tarsi postici elongati, metatarso terete, mesotarso bilobato, articulo ultimo metatarso æque longo. Ovipositor subrectus, femore postico haud longior. ♀

Dispositio specierum.

1. Elytra brevia adsunt. Tibiæ posticæ superne in latere interno spinis distinctis armatæ ..... 1. *alatus*, sp. n.
1'. Elytra nulla. Tibiæ posticæ superne utrinque serrulatæ ..... 2. *forficularis*, sp. n.

28. PROGNATHOGRYLLUS ALATUS, sp. n. (Fig. 1.)

Fig. 1.



Prognathogryllus alatus.

Ferrugineus. Frons infra insertionem antennarum cum marginibus scrobum antennarum infuscata. Occiput fasciis fuscis ornatum. Pronotum fusco-variegatum, margine postico late

limbato. Elytra metanotum parum superantia, fusca, venis pallidis. Tibiæ posticæ in margine interno spinulis 10 *armatæ. Cerci ovipositorem æquantes.* ♀.

Long. corporis....	21 millim.
„ pronoti	4
„ elytrorum ..	5·5
„ femor. post.	12
„ ovipositoris .	8·5

Waimea Mts., 4000 ft., Kauai (*Perkins*).

29. Prognathogryllus forficularis, sp. n. (Fig. 2.)

Fig. 2.

Prognathogryllus forficularis.

Statura minore. Corpore aptero, fusco-ferrugineo, latere utrinque fascia fusca a capite usque ad apicem abdominis ornato. Frons cum occipite tota pallida. Antennæ graciles, infuscatæ. Pronotum margine postico truncato, acuto (non limbato). Tibiæ omnes fusco-annulatæ, posticæ superne utrinque serratæ. Cerci tertiam partem ovipositoris haud superantes. ♀.

Long. corporis....	12 millim.
„ pronoti	3
„ femor. post.	7·5
„ ovipositoris .	4·5

Kona, 3000 ft., Hawaii (*Perkins*).

5. On the Classification of the *Schœnobiinæ* and *Crambinæ*, two Subfamilies of Moths, of the Family *Pyralidæ*. By G. F. Hampson.

[Received October 7, 1895.]

The two subfamilies of Pyralidæ, the *Schœnobiinæ* and *Crambinæ*, of which a classification is here given, have much resemblance to each other in both superficial appearance and structure, and are also equally nearly related to the *Hydrocampinæ*, all three subfamilies being parallel developments from the primitive stock of the Pyralidæ, of which the more generalized *Pyraustinæ* and the *Scopariinæ* are probably the nearest living representatives.

The *Schœnobiinæ* have become differentiated from the *Pyraustinæ* in the loss of the proboscis, the *Crambinæ* in the pectination of the median nervure of the hind wing, whilst the long porrect palpi and triangularly scaled maxillary palpi are highly characteristic of nearly the whole of the genera of both subfamilies.

The classification of the *Schœnobiinæ* as a group is new; their habitat being principally in the Oriental and Neotropical regions, with but few genera and species in the Palæarctic region.

The *Crambinæ*, however, are found in almost equal numbers in all the Zoological regions, and their classification, as here given, is an extension of the excellent system adopted by Mr. Meyrick in his paper on the Pyralidæ of the European fauna.

The types of all the new species described are in the Collection of the British Museum, and I have to thank Mr. W. Schaus for the generous gift of examples of all the species, from the Neotropical region, of which he had more than one specimen in his collection, for purposes of description in this paper. I have also to thank Mr. Meyrick for the loan of many Australian and New Zealand species which were not in the collection of the British Museum, and Mr. Bethune-Baker for the loan of many Palæarctic species. I have included the well-known European species without references and synonymy, which can easily be found in Staudinger's catalogue and other works, but full references are given to extra-Palæarctic species. Species of which I have examined specimens, but which are not represented in the British Museum collection, are marked with an asterisk; species of which I have not been able to see specimens and of which the classification is uncertain are placed at the end of each genus; and described species of which the types are in the Museum are marked thus (†); whilst at the end of the paper will be found a list giving the families to which species wrongly described as *Crambinæ* should be referred.

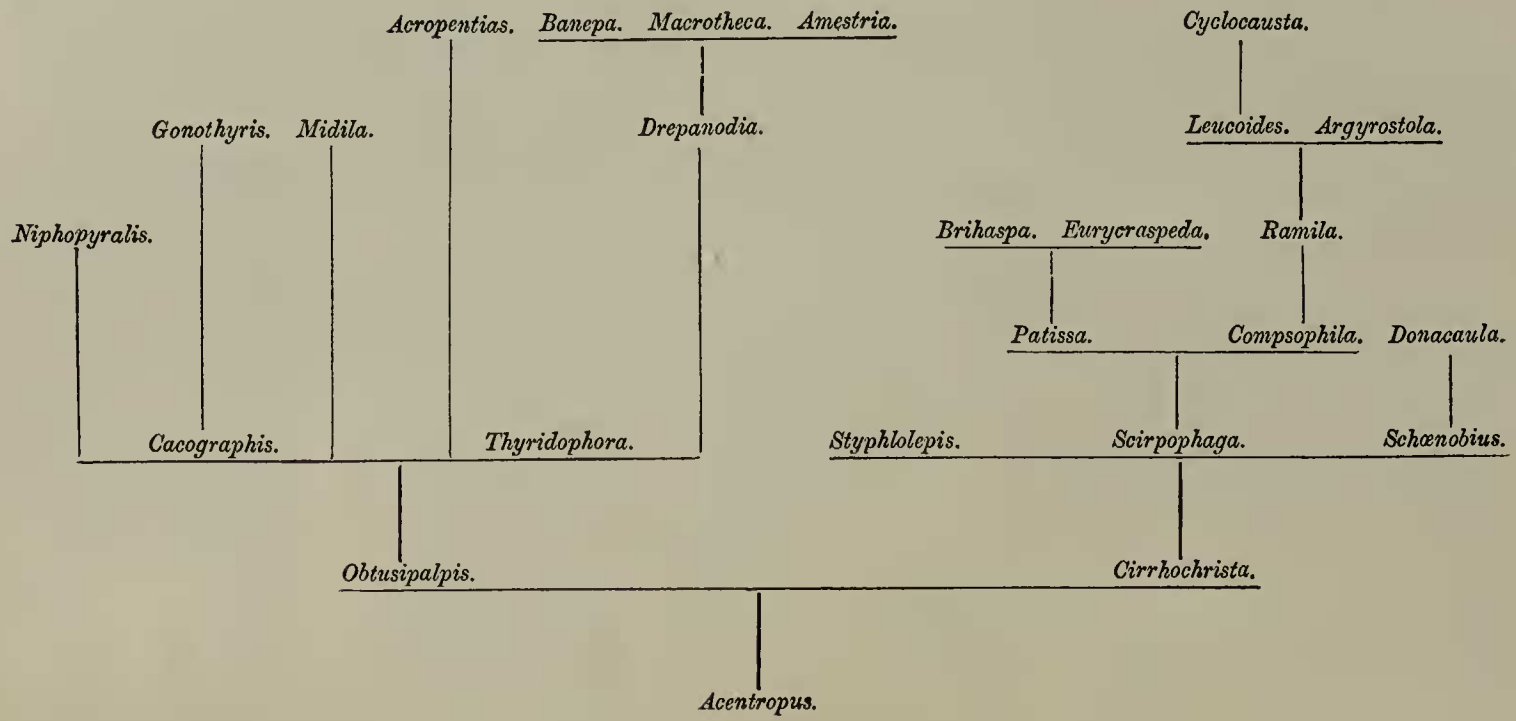
Subfamily SCHŒNOBIINÆ.

Proboscis absent or very minute; palpi usually porrect, the maxillary palpi being usually well developed and dilated with scales at extremity. Fore wing with vein 7 usually from cell. Hind wing with the median nervure not pectinated on upperside; vein 7 usually anastomosing with 8.

The larvæ of the species of which the early stages are known feed in the interior of reeds or on aquatic plants.

The absence of the proboscis, combined with the non-pectination of the median nervure of the hind wing, will distinguish the genera of this subfamily from all other Pyralidæ, except *Aglossa*, *Crocalia*, and a few other genera of the Pyralinæ, from which those forms that have vein 7 of the fore wing stalked with 8, 9 are easily distinguished by vein 7 of the hind wings anastomosing with 8.

Phylogeny of the Schœnobiinæ.



Key to the Genera.

A. Palpi upturned.
  a. Maxillary palpi minute; antennæ of male pectinated; fore wing with veins 8, 9 stalked ..... 1. *Niphopyralis.*
  b. Maxillary palpi well developed; antennæ of male non-pectinate.
    a'. Fore wing with veins 8, 9, 10 stalked; the outer margin angled at vein 3 ..... 2. *Gonothyris.*
    b'. Fore wing with veins 8, 9 stalked; the outer margin evenly curved ..... 3. *Cacographis.*
B. Palpi with the 2nd joint porrect, the third upturned; fore wing with veins 7, 8, 9, 10 stalked ..... 6. *Banepa.*
C. Palpi porrect.
  a. Fore wing with veins 7, 8, 9, 10 stalked.
    a'. Fore wing with veins 4, 5 stalked; hind wing with vein 4 absent.
      a^2. Fore wing with vein 7 from 8 before 9 ..... 7. *Amestria.*
      b^2. Fore wing with vein 7 from 8 after 9 ..... 8. *Macrotheca.*
    b'. Fore wing with veins 4, 5 from the cell; hind wing with vein 4 present.
      a^2. Palpi extending about four times length of head; fore wing with vein 11 free ..... 9. *Drepanodia.*
      b^2. Palpi extending about twice the length of head; fore wing with vein 11 becoming coincident with 12 ..... 12. *Cyclocausta.*
  b. Fore wing with vein 10 anastomosing with 7, 8, 9 to form an areole ..... 13. *Argyrostola.*
  c. Fore wing with veins 7, 8, 9 stalked, 10 free.
    a'. Both wings with veins 4, 5 stalked ..... 14. *Leucoides.*
    b'. Both wings with veins 4, 5 from cell.
      a^2. Fore wing with vein 11 becoming coincident with 12; the apex produced and acute ..... 15. *Ramila.*
      b^2. Fore wing with vein 11 free.
        a^3. Fore wing with the apex rounded; both wings with the outer margin evenly curved. 16. *Compsophila.*
        b^3. Fore wing with the apex produced to a point; both wings with the outer margin produced to a point at vein 4 ..... 4. *Midila.*
  d. Fore wing with vein 7 from cell.
    a'. Fore wing with veins 8, 9, 10, 11 stalked ..... 5. *Acropentias.*
    b'. Fore wing with veins 8, 9, 10 stalked.
      a^2. Palpi projecting about twice the length of head; hind wing with vein 7 anastomosing with 8 to near apex.
        a^3. Frons smooth; abdomen with lateral tufts towards extremity ..... 17. *Eurycraspeda.*
        b^3. Frons with a sharp tuft; abdomen without lateral tufts ..... 18. *Brihaspa.*
      b^2. Palpi projecting about the length of head; hind wing with vein 7 anastomosing with 8 to about three fourths of wing ..... 19. *Patissa.*
      c^2. Palpi projecting about three times length of head; hind wing with vein 7 slightly anastomosing with 8 ..... 23. *Donacaula.*
    c'. Fore wing with veins 8, 9 stalked, 10 from cell.
      a^2. Fore wing with veins 6, 7 stalked.
        a^3. Palpi projecting about the length of head; fore wing of male with a hyaline vesicle beyond the cell ..... 10. *Thyridophora.*
        b^3. Palpi projecting about twice the length of head and downcurved at extremity ..... 20. *Styphlolepis.*

b^2. Fore wing with veins 6, 7 from cell.
  a^3. Palpi with the 3rd joint short and blunt..... 11. *Obtusipalpis.*
  b^3. Palpi with the 3rd joint long and down-curved.
    a^4. Frons flat and oblique; fore wing with the apex rounded..... 24. *Cirrhochrista.*
    b^4. Frons with a rounded projection; palpi once to twice the length of head..... 21. *Scirpophaga.*
    c^4. Frons with a slight tuft; palpi three to four times length of head ..... 22. *Schœnobius.*
  c^3. Palpi dilated towards extremity; tibiæ with the spurs minute; fore wing with vein 1 *b* not reaching outer angle ..... 25. *Acentropus.*

Genus Niphopyralis.

Niphopyralis, Hmpsn. Ill. Het. ix. p. 181 (1893).

Palpi upturned, smoothly scaled and hardly reaching vertex of head; maxillary palpi minute; frons rounded; antennæ of male bipectinated; tibiæ with the spurs nearly equal. Fore wing short and rounded; vein 3 from near angle of cell; 4, 5 from angle; 7 well separated from 8, 9; 10, 11 free. Hind wing with veins 3, 4, 5 from angle of cell; 6, 7 from upper angle.

Fig. 1.

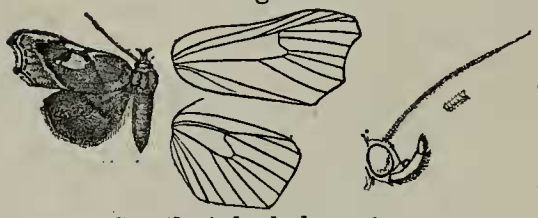
Niphopyralis nivalis, ♂. $\frac{2}{1}$.

(1)†Niphopyralis nivalis, Hmpsn. Ill. Het. ix. p. 181, pl. 174. f. 6. Ceylon.
(2)†Niphopyralis contaminata, Hmpsn. Ill. Het. ix. p. 181, pl. 174. f. 14. Ceylon.
(3)†Niphopyralis albida, Hmpsn. Ill. Het. ix. p. 181, pl. 174. f. 25. Bhután; Bombay; Ceylon; Borneo.
Niphopyralis suffidalis, Swinh. A. M. N. H. (6) xvi. p. 299.

Genus Gonothyris, nov.

Palpi obliquely upturned, the 2nd and 3rd joints fringed with hair in front; maxillary palpi well developed and nearly filiform; frons oblique and thickly clothed with hair; antennæ of male somewhat annulated and strongly ciliated; spurs well developed and equal. Fore wing with the costa strongly arched at base; the outer margin produced to a point at vein 7, then excised to vein 3, where it is strongly angled; vein 3 from before angle of cell; 4, 5 from angle; 7 well separated from 8, 9, 10, which are stalked. Hind wing with the outer margin angled at vein 3; 6, 7 from upper angle.

Fig. 2.



Gonothyris hyaloplaga, ♂. ½.

Type. †Gonothyris hyaloplaga, n. sp.

♂. Bright vinous red; palpi slightly marked with white; vertex of head whitish; abdomen with white band on 3rd segment; underside of thorax and abdomen and the legs pure white, the fore tibia and tips of the spurs rufous. Fore wing with indistinct curved subbasal line with grey speck on it at costa; an oblique antemedial line arising from an outwardly oblique white costal fascia; a short medial white fascia on costa; a very large hyaline lunule in end of cell, with white speck beyond lower angle; a postmedial line running out to a very acute angle on vein 7, the costal area beyond it white, and the outer area grey down to vein 2; a marginal series of red spots; the cilia pale with their bases red, red also below apex and at the angle. Hind wing deeper vinous red, with oblique dark medial line. Underside white; the outer area of fore wing brownish; both wings with minutely dentate postmedial line arising from a dark spot on the costa.

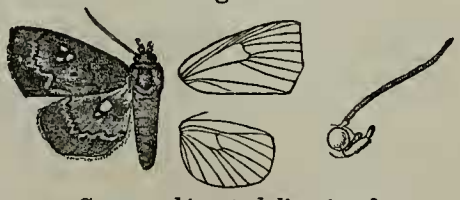
Hab. Rio Janeiro, Brazil. *Exp.* 30 mm.

Genus Cacographis.

Cacographis, Led. Wien. ent. Mon. 1863, p. 360.
Zazanisa, Wlk. xxxiii. 1106 (1865).

Palpi obliquely upturned, the 2nd joint moderately scaled in front, the 3rd thick; maxillary palpi somewhat dilated with scales; frons oblique and heavily scaled; antennæ of male very much thickened and flattened, with appressed serrations; spurs long and nearly equal. Fore wing broad, the outer margin nearly evenly curved; vein 3 from before angle of cell; 4, 5 from angle; 7 well separated from 8, 9, which are on a very long stalk; 10, 11 free. Hind wing with veins 3, 4, 5 from near angle of cell; 6, 7 from upper angle.

Fig. 3.



Cacographis osteolalis, ♂. ½.

Type. Cacographis osteolalis, Led. Wien. ent. Mon. 1863, p. 360.
Bogotá; Venezuela.

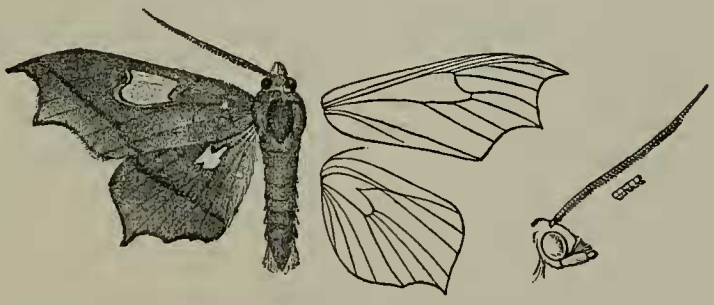
†*Zazanisa specularis*, Wlk. xxxiii. 1107.

Genus Midila.

Midila, Wlk. xvi. 8 (1858).
Ametres, H.-S. Aussereur. Schmett. p. 74 (1843), preocc.
Singamia, Moesch. Faun. Surinam, p. 433 (1881).
Tetraphana, Rag. Ann. Soc. Ent. Fr. 1890, p. 471.

Proboscis aborted; palpi thickly scaled and extending slightly beyond the frons, which is slightly prominent; maxillary palpi triangularly scaled and as long as the labial; antennæ of male with short uniseriate branches; tibiæ fringed with long hair. Fore wing with the costa arched at apex, which is much produced and acute; the outer margin produced to a long point at vein 4; vein 3 from before angle of cell; 4, 5 widely separate at origin; the discocellulars much curved; vein 6 from below upper angle; 7, 8, 9 stalked; 10, 11 free. Hind wing with the outer margin produced to a long point at vein 4; veins 2 and 3 arising close together; 4, 5 widely separated; the discocellulars strongly angled; veins 6, 7 from upper angle.

Fig. 4.



Midila quadrifenestrata, ♂. ½.

Type. Midila quadrifenestrata, H.-S. Auss. Schmett. p. 74, pl. 70. f. 401. S. America.
† „ *attacalis*, Wlk. xvi. 8.

List of undetermined Species.

Tetraphana daphne, Druce, Biol. Centr.-Amer., Het. ii. p. 197, pl. 60. ff. 5, 6. Mexico.
Tetraphana alipes, Pagenst. Isis, v. p. 3, pl. 1. f. 1. Mexico; Amazons.

Genus Acropentias.

Acropentias, Meyr. Trans. Ent. Soc. 1890, p. 470.

Palpi porrect, extending about twice the length of head, the 2nd joint fringed with hair below and with a long pointed tuft at extremity; maxillary palpi triangularly scaled; frons rounded; antennæ of male minutely serrate and fasciculate; hind tibiæ fringed with hair on outer side. Fore wing with the outer margin somewhat excised from apex to vein 3; vein 3 from well before angle of cell; 4, 5 shortly stalked; 7 from upper angle; 8, 9,

10, 11 stalked. Hind wing with vein 3 from close to angle of cell; 4, 5 shortly stalked; 6, 7 from upper angle.

Fig. 5.

Acropentias aureus, ♂. ½.

Type. †Acropentias aureus, Butl. A. M. N. H. 1878, i. p. 402. E. Siberia; Japan.

†*Marimatha straminea*, Butl. Ill. Het. iii. p. 79, pl. 58. f. 2.

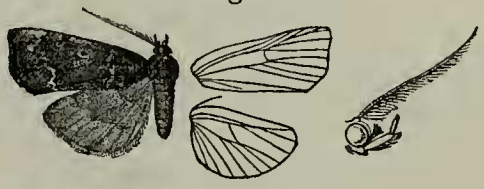
Sparagmia obtusalis, Christ. Bull. Mosc. lvi. 1881, p. 26.

Genus Banepa.

Banepa, Moore, Lep. Atk. p. 204 (1887).

Palpi with the 2nd joint long, porrect, and clothed with hair, the 3rd upturned and long; maxillary palpi triangularly scaled; proboscis minute; antennæ of male bipectinate; legs smoothly scaled, the spurs long. Fore wing with the costa arched at base, then straight; the apex produced; the outer margin excised from apex to vein 5, where it is excurved, then oblique to outer angle; vein 3 from before angle of cell; 4, 5 from angle; 7, 8, 9, 10 stalked. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 on a long stalk.

Fig. 6.



Banepa atkinsoni, ♂. ½.

Type. †Banepa atkinsoni, Moore, Lep. Atk. p. 204. Sikhim.

Genus Amestria.

Amestria, Rag. Ann. Soc. Ent. Fr. 1890, p. 545.

Palpi porrect, thickly scaled, and reaching just beyond frons, which is rounded; maxillary palpi thickly scaled; antennæ of male ciliated; tibiæ smooth. Fore wing rather narrow; vein 3 from angle of cell; 4, 5 stalked; 6 from well below upper angle; 7, 8, 9, 10 stalked, 7 being given off before 9; 11 free. Hind wing with veins 3 and 5 from angle of cell; 4 absent; 6, 7 from upper angle.

Type. *Amestria oculiferalis, Rag. Ann. Soc. Ent. Fr. 1890, p. 546, pl. 5. f. 10. U.S.A.

Genus Macrotheca.

Macrotheca, Rag. Ann. Soc. Ent. Fr. 1890, p. 545.

Palpi porrect, thickly scaled, and extending about the length of head; maxillary palpi well developed and tufted with hair; frons with a slight tuft; antennæ of male ciliated; tibiæ smoothly scaled. Fore wing rather long and narrow; vein 3 from angle of cell; 4, 5 stalked; 6 from well below upper angle; 7, 8, 9, 10 stalked, 7 being given off after 9; 11 free. Hind wing with veins 3 and 5 from angle of cell, 4 absent; 6, 7 from upper angle.

Type. *Macrotheca interalbicalis, Rag. Ann. Soc. Ent. Fr. 1890, p. 545, pl. 5. f. 12. Mexico.

Genus Drepanodia.

Drepanodia, Rag. Ann. Soc. Ent. Fr. 1891, p. 616.

Palpi porrect, extending about four times length of head, almost straight and thickly scaled; maxillary palpi triangularly scaled; proboscis minute; frons produced to a conical point; antennæ of male almost simple. Fore wing with the costa arched at base, then almost straight, the apex falcate; the outer margin excised below apex and towards anal angle, excurved at middle; vein 3 from before angle of cell; 4, 5 well separated at origin; 6 from below upper angle; 7, 8, 9, 10 stalked; 11 free. Hind wing with the anal angle truncate; vein 3 from before angle of cell; 4, 5 from angle; 6, 7 shortly stalked.

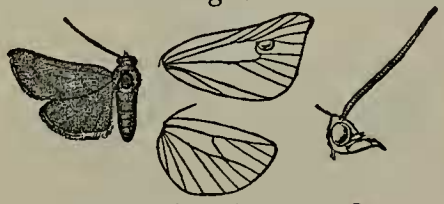
Type. *Drepanodia xerophyllalis, Rag. Ann. Soc. Ent. Fr. 1891, p. 617. Brazil.

Genus Thyridophora.

Thyridophora, Warr. P. Z. S. 1888, p. 311.

Palpi porrect and smoothly scaled, extending about the length of head, the 3rd joint downcurved; maxillary palpi long and somewhat dilated at extremity; frons flat and oblique; antennæ thickened and flattened; legs short, the tibiæ hairy, with the spurs nearly equal. Fore wing with the apex produced and the outer margin oblique; the cell very long; vein 3 from before angle; 4, 5 well separated at origin; male with a hyaline vesicle beyond upper angle below veins 6, 7, which are stalked. Hind wing with the cell very long; vein 3 from near angle; 4, 5 from angle; 6, 7 shortly stalked.

Fig. 7.



Thyridophora furia, ♂. ½.

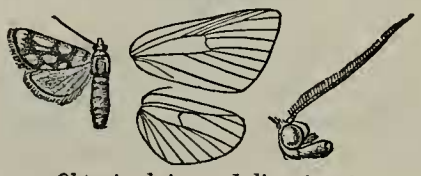
Type. †Thyridophora furia, Swinh. P. Z. S. 1884, p. 519, pl. 47. f. 13. Punjab; Sind.

† „ *fenestrata*, Warr. P. Z. S. 1888, p. 311.

Genus Obtusipalpis, nov.

Palpi porrect, extending about the length of head, the 2nd joint thickly scaled and rounded at extremity, the 3rd short and blunt; maxillary palpi long and dilated with scales; frons rounded; antennæ of male ciliated; hind tibiæ with the outer medial spur minute. Fore wing with the apex rounded; veins 3, 4, 5 from close to angle of cell; 10 approximated to 8, 9; 11 free. Hind wing with vein 3 from angle of cell; 4, 5 approximated for a short distance; 6, 7 from upper angle.

Fig. 8.



Obtusipalpis pardalis, ♂. ½.

Type. †Obtusipalpis pardalis, n. sp.

♂. Head, thorax, and abdomen white, marked with golden brown; palpi with a black stripe above; fore legs banded with black. Fore wing golden brown, with a white basal mark; an ill-defined antemedial white band; a large medial white spot on costa, and smaller spot on inner margin; a postmedial series of three large spots; the apical area white; a spot above outer angle; a dark marginal line expanding into a series of specks at the veins. Hind wing white, with fine dark marginal line.

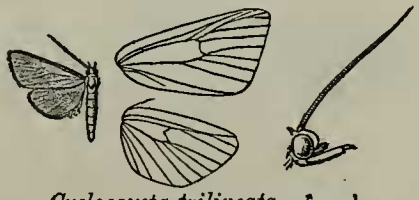
Hab. Delagoa Bay, Australia. *Exp.* 20 mm.

Genus Cyclocausta.

Cyclocausta, Warr. Trans. Ent. Soc. 1889, p. 274.

Palpi porrect, extending about twice the length of head, and moderately fringed with hair; maxillary palpi long and dilated with scales; frons rounded; antennæ of male thickened by appressed serrations. Fore wing with the apex acute and the outer margin oblique; vein 3 from before angle of cell; 4, 5 from angle; 7, 8, 9, 10 stalked; 11 becoming coincident with 12. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 stalked; the outer margin somewhat angled at vein 2.

Fig. 9.



Cyclocausta trilineata, ♂. ½.

Type. †Cyclocausta trilineata, Warr. Trans. Ent. Soc. 1889, p. 274.

Amazons.

Genus Argyrostola, nov.

Palpi porrect, extending about the length of head, the 3rd joint hairy; maxillary palpi with a tuft of long hair at extremity, and nearly as long as the labial; frons rounded; antennæ minutely serrate and fasciculate; spurs short. Fore wing with the apex rectangular; vein 3 from before angle of cell; 4, 5 from angle; 7, 8, 9 stalked, and 10 anastomosing with them to form an areole; 11 becoming coincident with 12. Hind wing with veins 3, 4, 5 well separated at origin; 6, 7 shortly stalked; the outer margin somewhat angled at vein 2.

Fig. 10.

Argyrostola ruficostalis, ♂. ½.

Type. †Argyrostola ruficostalis, n. sp.

♂. Silvery white; palpi, frons, fore tibiæ, and tarsi rufous; a rufous stripe on shoulders. Fore wing with the costa rufous; both wings with a more or less prominent submarginal curved series of specks.

Hab. Rio Janeiro, Brazil. *Exp.* 32–44 mm.

Genus Leucoides.

Leucoides, Hmpsn. Ill. Het. ix. p. 167 (1893).

Palpi porrect, slightly scaled, and extending about twice the length of head; maxillary palpi long and somewhat dilated with scales at extremity; frons produced and acute; antennæ of male minutely serrate and ciliated; legs long and slender, the outer spurs about two thirds length of inner; abdomen long; wings long and narrow. Fore wing with the apex produced and acute; the outer margin oblique; vein 3 from angle of cell; 4, 5 stalked; 6 from upper angle; 7, 8, 9 stalked; 10 free; 11 becoming coincident with 12. Hind wing with vein 3 from near angle of cell; 4, 5 stalked; 6, 7 stalked.

Fig. 11.

Leucoides fuscicostalis, ♂. ½.

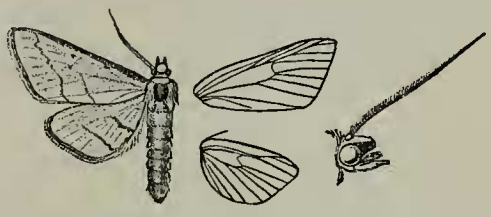
Type. †Leucoides fuscicostalis, Hmpsn. Ill. Het. ix. p. 168, pl. 172. f. 18. Ceylon.

Genus Ramila.

Ramila, Moore, P. Z. S. 1867, p. 667.
Crambostenia, Swinh. Trans. Ent. Soc. 1890, p. 292.

Palpi porrect and slightly scaled, the 3rd joint downcurved; maxillary palpi dilated with scales and nearly as long as the labial; frons produced to a rounded projection nearly as long as palpi; antennæ ciliated; tibiæ slightly hairy, the spurs short. Fore wing with the apex produced to a point; vein 3 from before angle of cell; 4, 5 from angle; 6 from near upper angle; 7, 8, 9 stalked; 11 becoming coincident with 12. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 stalked.

Fig. 12.



Ramila marginella, ♂. ½.

Type. (1)†Ramila marginella, Moore, P. Z. S. 1867, p. 667, pl. 33. f. 16. Sikhim.

(2)†Ramila ruficostalis, Hmpsn. Ill. Het. ix. p. 166, pl. 173. f. 22. Ceylon.

(3)†Ramila arcusalis, Wlk. xviii. 534. Moreton Bay, Australia.

(4)†Ramila angustifimbrialis, Swinh. Trans. Ent. Soc. 1890, p. 293. Burma.
† „ „ Warr. A.M.N.H. (6) ix. p. 430.

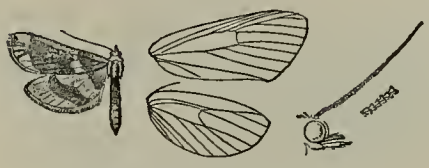
(5)†Ramila acciusalis, Wlk. xix. 977; Moore, Lep. Ceyl. iii. pl. 184. f. 5. Sikhim; Ceylon; Borneo.

Genus Compsophila.

Compsophila, Meyr. Trans. Ent. Soc. 1886, p. 256.
Niphadaza, Butl. Trans. Ent. Soc. 1886, p. 422.

Palpi porrect, extending about twice the length of head, and clothed with rough hair; maxillary palpi long, with tufts of hair at extremity; frons rounded; antennæ of male annulated and ciliated; the outer spurs two thirds length of inner. Fore wing with the apex rounded; vein 3 from before angle of cell; 4, 5 from angle; 7, 8, 9 stalked; 10, 11 free. Hind wing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Fig. 13.



Compsophila iocosma, ♂. ½.

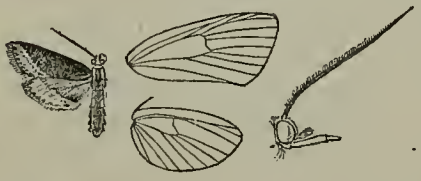
Type. Compsophila iocosma, Meyr. Trans. Ent. Soc. 1886, p. 256. Fiji.
†*Niphadaza bicolor*, Butl. Trans. Ent. Soc. 1886, p. 423.

Genus Eurycraspeda.

Eurycraspeda, Swinh. Trans. Ent. Soc. 1890, p. 284.

Palpi porrect, slightly scaled, and projecting about twice the length of head; maxillary palpi long and dilated with scales at extremity; antennæ ciliated; abdomen long, with lateral tufts of hair towards extremity; wings long and narrow. Fore wing with vein 3 from before angle of cell; 4, 5 well separated at origin; 7 straight, and well separated from 8, 9, 10; 11 becoming coincident with 12. Hind wing with vein 3 from before angle of cell; 4, 5 well separated at origin; 6, 7 stalked.

Fig. 14.



Eurycraspeda burmanalis, ♂. ½.

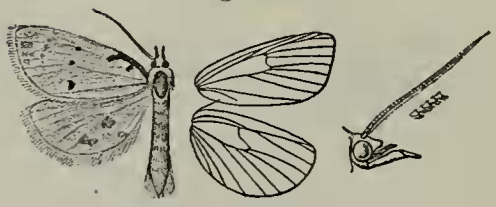
Type. †Eurycraspeda burmanalis, Swinh. Trans. Ent. Soc. 1890, p. 285, pl. 7. f. 19. Burma.

Genus Brihaspa.

Brihaspa, Moore, P. Z. S. 1867, p. 666.
Leptosteges, Warr. Trans. Ent. Soc. 1889, p. 291.

Palpi porrect, clothed with rough hair and extending about twice the length of head; maxillary palpi long and dilated with scales at extremity; frons with a sharp tuft; antennæ of male minutely serrate and ciliated; tibiæ with the outer spurs about two thirds length of inner. Fore wing rather broad, the apex rounded, vein 3 from before angle of cell; 4, 5 well separated at origin; 7 straight and well separated from 8, 9, 10, which are stalked. Hind wing with vein 3 from before angle of cell; 4, 5 well separated at origin; 6, 7 on a long stalk, 7 anastomosing with 8 almost to apex.

Fig. 15.



Brihaspa atrostigmella, ♂. ½.

Sect. I. (*Brihaspa*). Fore wing with vein 11 becoming coincident with 12.

Type. (1)†Brihaspa atrostigmella, Moore, P. Z. S. 1867, p. 666, pl. 33. f. 13. Sikhim; Burma.

(2)†Brihaspa bisangulata, n. sp.

White; fore wing with indistinct interrupted fulvous subbasal band, an oblique fulvous band from costa to discocellulars, where it is met by a V-shaped fulvous mark on outer part of costa, its apex on vein 5, also by a band running from apex to vein 3, then recurved to discocellulars; a large fuscous patch between lower angle of cell and inner margin. Hind wing with the discal area from before middle to near outer margin occupied by a fuscous patch, becoming fulvous on subapical area.

Hab. Sikhim, Bengal (*Dudgeon*). *Exp.* 18 mm.

(3)†Brihaspa frontalis, Wlk. xxxiv. 1361. Natal.

Sect. II. (*Leptosteges*). Fore wing with vein 11 anastomosing with 12.

(4)†Brihaspa pulverulenta, Warr. Trans. Ent. Soc. 1889, p. 291. Amazons.

(5)†Brihaspa nigricostella, n. sp.

♂. White; palpi and a stripe on shoulders black. Fore wing with the costal area black to two thirds of wing; a black spot below middle of cell; the disk irrorated with fuscous; an oblique maculate submarginal line from below apex ending in a spot on vein 1.

Hab. Castro Paraña, Brazil (*Jones*). *Exp.* 26 mm.

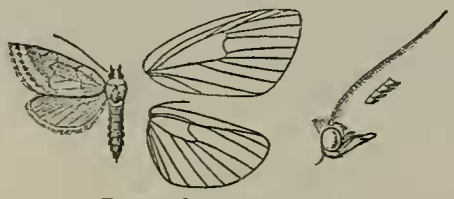
Genus Patissa.

Patissa, Moore, Lep. Ceyl. iii. p. 388 (1886).

Palpi porrect, clothed with rough hair and extending about the length of head; maxillary palpi dilated with scales; frons with a slight tuft; antennæ of male minutely serrate and ciliated; legs long and slender. Fore wing with the apex somewhat produced and the outer margin oblique; vein 3 from before angle of cell; 4, 5 well separated at origin; 7 straight and well separated from 8, 9, 10, which are stalked; 11 becoming coincident with 12.

Hind wing with vein 3 from before angle of cell; 4, 5 well separated at origin; 6, 7 stalked.

Fig. 16.



Patissa lactealis, ♂. ½.

(1)†Patissa latifuscalis, n. sp.

♀. White; the palpi and pectus fuscous black. Fore wing with the costal area fuscous black; a basal black patch not reaching inner margin; a medial black band very wide on costa and extending nearly to apex, narrowing to inner margin; a series of black spots on the cilia. Hind wing with diffused fuscous postmedial line, developed into a patch on middle of inner margin.

Hab. Sibsaghar, Assam. *Exp.* 26 mm.

Type. (2) Patissa lactealis, Feld. Reis. Nov. pl. 137. f. 38. S. India; Ceylon.

(3)†Patissa fulvosparsa, Butl. Trans. Ent. Soc. 1881, p. 591. Japan;
†*Metasia candidulalis*, Swinh. P. Z. S. 1885, p. 880, pl. 57. f. 6. N.W. Himalayas; W. & S. India;
Donacaula chlorosema, Meyr. Trans. Ent. Soc. 1894, p. 11. Ceylon; Burma; Java.
Patissa tortualis, Snell. Tijd. Ent. xxxvi. p. 58, pl. iii. f. 3.

(4) Patissa xantholeucalis, Guen. Delt. & Pyr. p. 25. U.S.A.; Brazil.
„ *semicostalis*, Snell. Tijd. v. Ent. xxxvi. p. 60.

(5)†Patissa erythrozonalis, n. sp.

Pure white; palpi and fore legs slightly tinged with fulvous. Fore wing with slightly oblique ferruginous band from upper angle of cell to inner margin; three ferruginous specks below costa towards apex and a marginal series of specks.

Hab. Punjab; Nilgiris; Ceylon. *Exp.* 14 mm.

(6)†Patissa virginea, Zell. Mon. Chil. & Cramb. p. 2. W. & S. India;
Crambus multivagellus, Swinh. P. Z. S. 1886, p. 462. Ceylon; S. Africa.

(7)†Patissa fuscipunctalis, n. sp.

♂. Pure shining white; palpi, antennæ at sides, and costa of fore wing dusky fulvous, the last with a dusky spot at lower angle of cell.

Hab. Espiritu Santo, Brazil. *Exp.* 24 mm.

(8)†Patissa curvilinealis, n. sp.

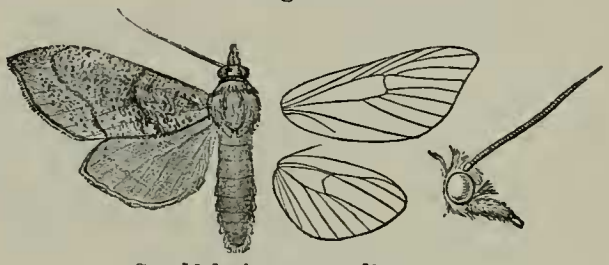
Yellowish white; palpi and antennæ tinged with rufous. Fore wing with the basal two thirds of costa reddish brown; a curved brown line from costa near apex to near base of inner margin; a marginal brown line. Hind wing white, with faint traces of an oblique medial brown line and a fine marginal line.

Hab. Ceylon (*Pole*). *Exp.* ♂ 12, ♀ 18 mm.

Genus Styphlolepis, nov.

Palpi rostriform, extending about twice the length of head, downcurved at extremity, and thickly scaled; maxillary palpi triangularly scaled; frons with a ridge of hair; antennæ of female thickened and flattened; tibiæ hairy. Fore wing with the costa arched towards apex, which is acute; veins 3, 4, 5 from close to angle of cell; 6, 7 shortly stalked; 10, 11 free. Hind wing with the outer margin produced to a point at vein 7; vein 3 from angle of cell; 4, 5 approximated for a short distance; 6, 7 from upper angle.

Fig. 17.



Styphlolepis squamosalis, ♂. ½.

Type. †Styphlolepis squamosalis, n. sp.

♀. White, the palpi bright ferruginous red; head and thorax suffused with ferruginous. Fore wing thickly irrorated with raised ferruginous scales; an ill-defined obliquely curved ferruginous medial line; a postmedial line angled below costa, then sinuous and inwardly oblique; a marginal line. Hind wing with hardly any ferruginous tinge; traces of a dentate submarginal line, which is well marked on underside towards costa; a slight marginal line.

Hab. Queensland. *Exp.* 50 mm.

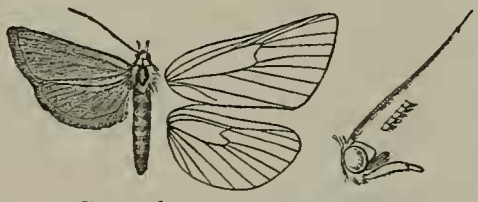
Genus Scirpophaga.

Scirpophaga, Treits. Schmett. Eur. ix. 1, p. 55 (1832).
Apurima, Wlk. xxvii. 194 (1863).
Rupela, Wlk. xxviii. 523.
Tipancea, Wlk. xxviii. 522.

Palpi porrect, extending from once to twice the length of head, slightly clothed with hair and with the 3rd joint downcurved; maxillary palpi rather short and dilated with scales; a slight

rounded frontal projection; antennæ of male minutely serrate and ciliated; patagia of male with spreading upturned hair; tibiæ with the outer spurs about half the length of inner; abdomen long, in female expanding at extremity and with very large anal tuft; wings long and narrow. Fore wing with vein 3 from before angle of cell; 4, 5 from angle; 7 straight and well separated from 8, 9; 10 and 11 free, or 11 becoming coincident with 12. Hind wing with vein 3 from near angle of cell; 6, 7 from upper angle.

Fig. 18.



Scirpophaga excerptalis, ♂. ½.

Sect. I. Hind wings with veins 4, 5 well separated at origin.

Type. (1) Scirpophaga prælata, Scop. Europe.

(2)†Scirpophaga patulella, Wlk. xxviii. 522. Australia; Tasmania.

,, *exsanguis*, Meyr. P. L. Soc. N.S.W. 1882, p. 161.

(3)†Scirpophaga excerptalis, Wlk. xxvii. 142. China; Formosa; N.W. Himalayas.

(4)†Scirpophaga gilviberbis, Zell. Mon. Chil. & Cramb. p. 2. Calcutta; S. India; Ceylon; Burma.

† ,, *fusciflua*, Hmpsn. Ill. Het. ix. p. 167, pl. 172. ff. 29, 30.

(5)†Scirpophaga chrysorrhoa, Zell. Mon. Chil. & Cramb. p. 1. China; Borneo; Java; Ceram.

†*Tipanæa innotata*, Wlk. xxviii. 523.

(6)†Scirpophaga occidentella, Wlk. xxviii. 524. Sierra Leone.

(7)†Scirpophaga auriflua, Zell. Mon. Chil. & Cramb. p. 2. Congo and Oriental region.

†*Apurima xanthogastrella*, Wlk. xxvii. 194; Moore, Lep. Ceyl. iii. pl. 184. f. 14.

Scirpophaga intacta, Snell. Tijd. Ent. xxxiv. p. 343, pl. xviii. f. 14 (var.).

(8) Scirpophaga monostigma, Zell. Mon. Chil. & Cramb. p. 3. Punjab; Bhután.

(9)†Scirpophaga xanthoperas, n. sp.

♀. Pure white. Fore wing with black spot at upper angle of cell; the apex orange-yellow on upper and under sides.

Hab. Sumatra. *Exp.* 30 mm.

(10)†Scirpophaga intactella, Wlk. xxviii. 523. Borneo.

(11) Scirpophaga albinella, Cram. pl. 372. f. D. U.S.A.;
†*Rupela nivea*, Wlk. xxviii. 524. S. America.

(12)†Scirpophaga leucatea, Zell. Mon. Chil. & Cramb. p. 2.
S. America.

(13)†Scirpophaga tinctella, Wlk. xxviii. 526. Honduras.

(14)†Scirpophaga vestaliella, Zell. Verh. z.-b. Wien, xxii. p. 532.
U.S.A.

(15)†Scirpophaga bisignata, Swinh. P. Z. S. 1885, p. 878.
Bombay; Bengal.

(16) Scirpophaga imparella, Meyr. P. L. Soc. N. S. W. 1879, p. 176. Australia.

(17)†Scirpophaga terrella, n. sp.

♀. Dull yellowish brown; abdomen with the two basal segments pale fulvous above; wings evenly irrorated with fuscous and without trace of markings.

Hab. Castro Paraña, Brazil (*Jones*). *Exp.* 34 mm.

(18)†Scirpophaga subcervinella, Wlk. xxvii. 140. Colombia.

(19)†Scirpophaga repugnatalis, Wlk. xxvii. 144.

Hab. Ignotus.

(20) Scirpophaga perstrialis, Hübn. Exot. Schmett. ff. 457, 458.
U.S.A.; S. Domingo.
†*Crambus semiradiellus*, Wlk. xxvii. 161.
Schœnobius macrinellus, Zell. Hor. Ent. Ross. xiii. p. 12, pl. 1. f. 12.

(21) Scirpophaga bivitta, Möschl. Verh. z.-b. Wien, xxxi. p. 437, pl. 18. f. 45. Surinam; Brazil.

Sect. II. Hind wing with veins 4, 5 closely approximated for some distance or stalked.

(22)†Scirpophaga cramboides, Wlk. xxxi. 230. N.W. Himalayas.

List of undetermined Species.

Scirpophaga sericea, Snell. Midd. Sum. iv. (1) 8, p. 79. Sumatra.
„ *zelleri*, Möschl. Verh. z.-b. Wien, xxxi. p. 435.
Surinam.
„ *ochroleuca*, Meyr. P. L. Soc. N. S. W. iv. p. 162.
Australia.
„ *fasciella*, Fern. Ent. Am. iii. p. 38. Florida.
„ *flavicostella*, Fern. Ent. Am. iii. p. 38. Florida.
„ *butyrota*, Meyr. Tr. Ent. Soc. 1889, p. 520.
New Guinea.

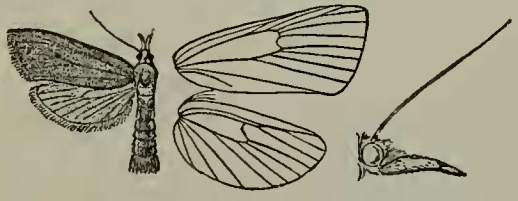
Scirpophaga longicornis, Möschl. Abh. Senck. Ges. xvi. p. 321. Porto Rico.
„ *cinerea*, Treit. Europe.
„ *mnesidora*, Meyr. Trans. Ent. Soc. 1894, p. 475. Sambawa.

Genus Schœnobius.

Schœnobius, Dup. Cat. Lep. Eur. p. 312 (1844).
Catagela, Wlk. Cat. xxvii. p. 191 (1863).
Panalipa, Moore, Lep. Ceyl. iii. p. 587 (1886).
Microschœnis, Meyr. Trans. Ent. Soc. 1887, p. 270.

Palpi roughly scaled, the 2nd joint two to three times, the 3rd about the length of head; maxillary palpi dilated with scales; frons with a slight tuft; antennæ of male minutely serrate and ciliated; legs long, tibiæ with the outer spurs about two thirds length of inner; abdomen long, in female dilated at extremity and with a large anal tuft; wings long and narrow. Fore wing with the apex rounded in male, more produced in female; vein 3 from before angle of cell; 4, 5 from angle; 7 straight and well separated from 8, 9; 10, 11 free, or 11 becoming coincident with 12. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 shortly stalked, 7 anastomosing slightly with 8, or free.

Fig. 19.



Schœnobius bipunctiferus, ♀. ½.

Sect. I. (*Panalipa*). Palpi with the 2nd joint about twice the length of head.

(1)†Schœnobius immeritalis, Wlk. xix. 830. India; Ceylon;
†*Araxes decursella*, Wlk. xxvii. 194. Siam.

Sect. II. (*Schœnobius*). Palpi with the 2nd joint about three times length of head.

(2) Schœnobius bipunctiferus, Wlk. xxviii. 523. Oriental
†*Chilo gratiosellus*, Wlk. xxx. 967. region.
†*Schœnobius punctellus*, Zell. Mon. Chil. & Cramb. p. 4.
†*Apurima gratiosella*, Butl. P. Z. S. 1880, p. 690.

(3)†Schœnobius dodatellus, Wlk. xxx. 966. Japan; India;
†*Chilo aditellus*, Wlk. xxx. 967. Ceylon and Burma.

Type. (4) Schœnobius gigantellus, Schiff. Europe; Shanghai.
†*Chilo spurcatellus*, Wlk. xxvii. 142.

(5) Schœnobius forficellus, Thunb. Europe.

(6)*Schœnobius niloticus, Zell. Stett. ent. Zeit. 1887, p. 397, and Trans. Ent. Soc. 1867, pl. 24. f. 2. Egypt.

(7)†Schœnobius auristrigellus, n. sp.

♂. White; palpi and shoulders golden yellow; abdomen slightly ringed with fuscous and with a dorsal yellow patch on 1st segment. Fore wing with golden-yellow fasciæ in the interspaces; a black spot at lower angle of cell; an oblique yellow line from apex to middle of inner margin. Hind wing pure white.

Hab. Bhután, Bengal (*Dudgeon*). *Exp.* 24 mm.

(8) Schœnobius alpherakii, Staud. Stett. ent. Zeit. 1874, p. 97. Armenia.

(9)†Schœnobius incertulas, Wlk. xxvii. 143.
†*Catagela admotella*, Wlk. xxvii. 192. Oriental region.
†*Schœnobius minutellus*, Zell. Mon. Chil. & Cramb. p. 6.

(10)†Schœnobius adjurellus, Wlk. xxvii. 191. Assam; Calcutta;
† „ *brunnescens*, Moore, Lep. Atk. p. 225. Ceylon; Borneo; N. Australia.
„ *celidias*, Meyr. Trans. Ent. Soc. 1894, p. 475.

(11) Schœnobius unipunctellus, Rob. Ann. Lyc. N. York, ix. 314. U.S.A.

(12)†Schœnobius porrectellus, Wlk. xxvii. 140. Amazons.

(13)†Schœnobius lanceolellus, n. sp.

♀. Head and thorax brownish ochreous; abdomen whitish, tinged in places with ochreous. Fore wing with the costal area suffused with brown; two black discocellular spots; spots below base and middle of cell, an oblique series from apex to below angle of cell, and a postmedial spot above vein 1; a marginal series of specks. Hind wing almost pure white.

Another specimen has the spots of fore wing obsolescent.

Hab. Amazons (*Trail*). *Exp.* 40 mm.

(14) Schœnobius montivagellus, Zell. Mon. Chil. & Cramb. p. 5. Venezuela; Brazil.

(15) Schœnobius longirostrellus, Clem. Contrib. v. p. 205. N. America.

(16) Schœnobius sordidellus, Zinck. Germ. Mag. iv. p. 247.
„ *dispersellus*, Rob. Grote's Check List, p. 56. Florida.

(17)†Schœnobius immanis, Zell. Hor. Ent. Ross. xiii. p. 11, pl. i. f. 2. Buenos Ayres.

(18)†Schœnobius majoralis, n. sp.

♀. Head, thorax, and abdomen pale rufous brown; anal tuft whitish. Fore wing pale rufous brown, with an obscure series of dark specks from near apex to inner margin just beyond middle. Hind wing pure white.

Another specimen has a diffused dark rufous fascia from base through the cell to the oblique specks and apex.

Hab. Afghanistan. *Exp.* 42 mm.

(19)†Schœnobius lineatus, Butl. A. M. N. H. iv. p. 457. Japan.

(20)†Schœnobius costalis, Moore, Lep. Ceyl. iii. p. 388, pl. 184. f. 15. Ceylon.

List of undetermined Species.

Schœnobius celidias, Meyr. Trans. Ent. Soc. 1894, p. 475. Borneo.
„ *tripunctellus*, Rob. Ann. Lyc. N. York, ix. 314. Texas.
„ *terreus*, Zell. Hor. Ent. Ross. xiii. 10. Madagascar.
„ *ochraceellus*, Snell. Midd.-Sum. iv. (1) 8, p. 79. Sumatra.
„ *vittatus*, Möschl. Verh. z.-b. Wien, xxxi. 435. Surinam.
„ *opalescalis*, Hulst, Tr. Am. Ent. Soc. xiii. p. 167. Arizona.
„ *chionotus*, Meyr. Tr. Ent. Soc. 1889, p. 519. New Guinea.
„ *maximellus*, Fern. Can. Ent. xxiii. p. 30. Texas.
„ *acutellus*, Ev. Europe.
„ *caminarius*, Zell. Micr. Caffr. p. 68. S. Africa.
„ *chrysostomus*, Zell. Micr. Caffr. p. 68. S. Africa.

Genus Donacaula.

Donacaula, Meyr. Trans. Ent. Soc. 1890, p. 466.

Palpi projecting about three times length of head and thickly scaled; maxillary palpi triangularly scaled; frons hairy; antennæ somewhat annulated and ciliated; abdomen long and slender; legs and spurs long. Fore wing with the apex rectangular in male, produced and acute in female; vein 3 from before angle of cell; 4, 5 from angle; 6 from below upper angle; 7 from angle; 8, 9, 10 stalked; 11 anastomosing with 12 or free. Hind wing with vein 3 from before angle of cell; 4, 5 well separated at origin; 6, 7 from upper angle, 7 anastomosing slightly with 8.

Fig. 20.

Donacaula mucronella, ♂. ½.

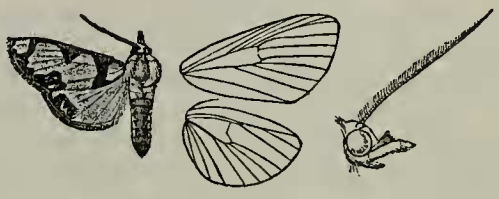
Type. Donacaula mucronella, Schiff. Europe.

Genus Cirrhochrista.

Cirrhochrista, Led. Wien. ent. Mon. 1863, p. 440.

Palpi porrect, thickly clothed with hair, the 3rd joint hidden by hair and downcurved; maxillary palpi long and triangularly scaled at extremity; frons oblique; antennæ ciliated; tibiæ clothed on outer side with rough hair, the outer spurs less than half the length of inner. Fore wing with the apex produced, the outer margin oblique; veins 3, 4, 5 from angle of cell; 7 curved and very closely approximated for a short distance to or well separated from 8, 9, to which 10 is approximated. Hind wing with veins 3, 4, 5 from angle of cell; 6, 7 shortly stalked.

Fig. 21.



Cirrhochrista pulchellalis, ♂. ½.

Sect. I. Palpi projecting about the length of head and with a tuft of porrect hair from 1st joint.

Type. (1) Cirrhochrista ætherialis, Led. Wien. ent. Mon. 1863, p. 441, pl. 17. f. 9. Amboina; Ternate.

(2) Cirrhochrista pulchellalis, Led. Wien. ent. Mon. 1863, p. 441, pl. 17. f. 10. Ceylon; Java; Amboina.

(3)†Cirrhochrista semibrunnea, n. sp.

♀. Head brown, with the vertex white; thorax and abdomen brown, the middle of collar, patagia, and basal segment of abdomen white. Fore wing brown, with a large white patch on basal inner area; a large crescentic white mark in cell, and much larger similar mark beyond the cell; a quadrate apical white patch; a yellow discocellular line and series of yellow marginal marks below the apical patch. Hind wing white; a large, round, brown submarginal spot between veins 2 and 5; some yellow on medial part of margin; a brown marginal line; cilia fulvous at base; inner area tinged with fuscous.

Hab. Bhután, India (*Dudgeon*). *Exp.* 36 mm.

Sect. II. Palpi projecting about twice the length of head and with no tuft from 1st joint.

(4)†Cirrhochrista brizoalis, Wlk. xix. 976; Moore, Lep. Atk. pl. 7. f. 10. *Cirrhochrista figuratalis*, Wlk. xxxiv. 1369. Japan; China; Formosa; throughout India and Ceylon; Borneo; Celebes; Australia.

(5) Cirrhochrista fumipalpis, Feld. Reis. Nov. pl. 135. f. 31. Sikhim; Assam; Burma; Moluccas.

(6)†Cirrhochrista bracteolalis, Hmpsn. Ill. Het. viii. p. 135, pl. 155. f. 3. Sikhim; S. India; Ceylon.

(7)†Cirrhochrista punctulata, n. sp.

♀. White; the palpi and a stripe on shoulders fulvous; tarsi banded with fulvous. Fore wing with a fulvous stripe on costa; a dark discocellular spot; medial and postmedial indistinct series of specks. Hind wing with indistinct postmedial series of specks; both wings with a dark marginal line expanding into specks at the veins.

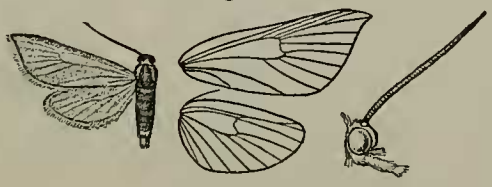
Hab. Rockhampton, Australia. *Exp.* 26 mm.

Genus Acentropus.

Acentropus, Curt. Brit. Ent. iv. pl. 497 (1862).

Palpi projecting about twice the length of head and dilated with scales at extremity; maxillary palpi loosely scaled; frons rounded; antennæ thickened and annulate; tibiæ with the spurs minute. Fore wing long and narrow, the apex produced; vein 1 *b* short and not reaching outer angle; 2, 3, 4, 5 widely separated at origin; 6 from below upper angle; 7 from angle; 8, 9 stalked; 10, 11 free. Hind wing with veins 3, 4, 5 well separated at origin; 6, 7 from upper angle, 7 anastomosing with 8 almost to apex. Wings in female often much abbreviated or aborted.

Fig. 22.



Acentropus niveus, ♂. ¾.

Type. (1) Acentropus niveus, Olivier, Encycl. Méth. p. 536, t. vi. W. Europe.

„ *hansoni*, Steph. Nomencl. 2 ed. Col. 118.

„ *garnonsii*, Curt. Brit. Ent. iv. pl. 497.

(2) Acentropus newæ, Kol. Wien. Monats. 1858, p. 382. Russia.

(3) Acentropus latipennis, Möschl. Wien. Monats. 1860, p. 55. Armenia.

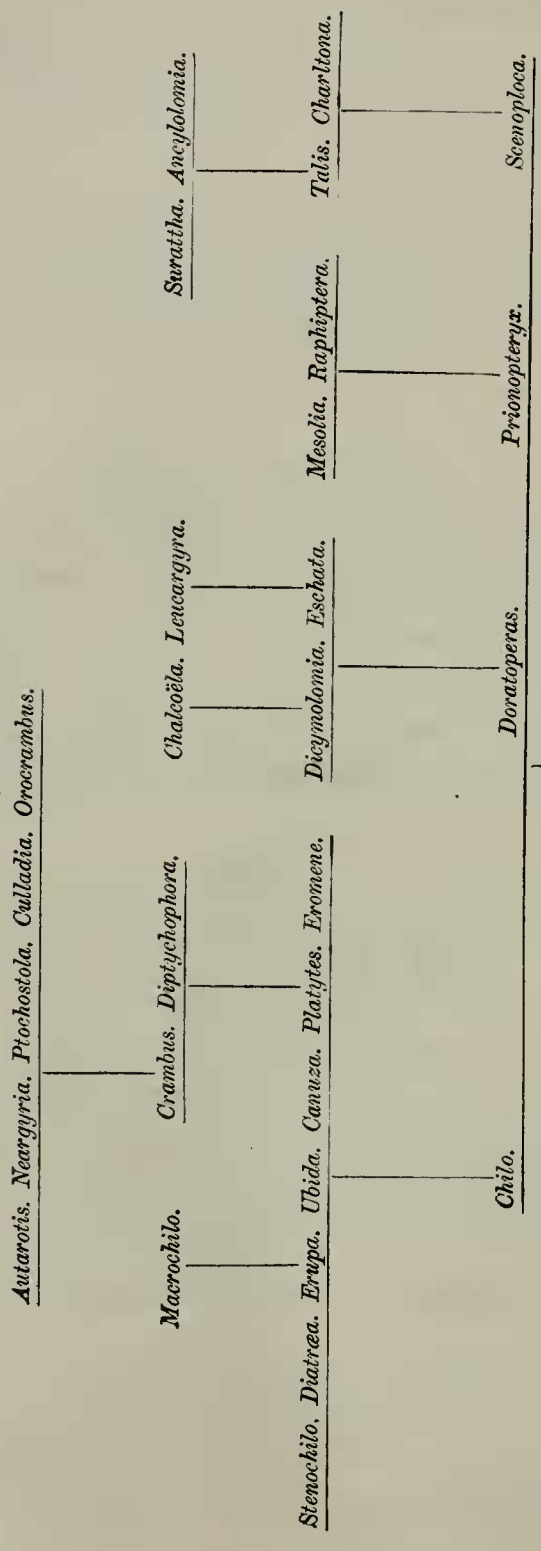
List of unrecognized Genera.

Idneodes tretopteralis, Rag. Ann. Soc. Ent. Fr. 1891, p. 605. Brazil.

Alpherakia obnubilalis, Christ. Bull. Mosc. lvi. p. 32 (1881). Amur.

Anæglis demissalis, Led. Wien. ent. Mon. 1863, p. 56, pl. 7. f. 1. Brazil.

PHYLOGENY OF THE CRAMBINÆ.



Ancœglis argentalis, Christ. Rom. Mem. iii. p. 106, pl. 5. f. 6. C. Asia.

Callasopia rosealis, Möschl. Lep. Porto Rico, p. 275. Porto Rico.

Parasopia dissimilalis, Möschl. Lep. Porto Rico, p. 275. Porto Rico.

Subfamily CRAMBINÆ.

Proboscis often absent or minute; palpi porrect; the maxillary palpi well developed and triangularly dilated with scales. Fore wing with vein 7 present*; vein 1 *a* separate from 1 *b*. Hind wing with the median nervure pectinated on upperside; vein 7 almost always anastomosing with 8.

The larvæ are usually grass or reed feeders.

Of the subfamilies of Pyralidæ that have the median nervure pectinated, the *Crambinæ* may be distinguished from the *Phycitinæ* and *Anerastiinæ* by the presence of vein 7 of the fore wings*; from the *Galleriinæ* by vein 1 *a* being separate from 1 *b* instead of forming a fork with it, also by the labial palpi being well developed in the male instead of almost obsolete, and the maxillary palpi triangularly scaled; from the *Oxychirotinæ* by having the outer spurs of mid and hind tibiæ well developed instead of absent, and also by the very different shape of the wings. Whilst in the few genera of *Pyraustinæ* and *Scopariinæ* that have the median nervure pectinated, the very different form of the labial and maxillary palpi will at once serve as a distinction.

Key to the Genera.

A. Hind wing with vein 6 from upper angle of cell.
† *a*. Fore wing with veins 7, 8 stalked, 10 from cell.
a^1. Hind wing with the upper margin of the cell approximated to 8; fore wing with the apical area not produced.
a^2. Both wings with vein 3 present.
a^3. Fore wing with veins 2, 3 stalked ..... 1. *Autarotis.*
b^3. Fore wing with veins 2, 3 from cell.
a^4. Thorax below and coxæ smooth.
a^5. Fore wing with veins 10, 11 stalked..... 2. *Neargyria.*
b^5. Fore wing with veins 10, 11 from cell... 6. *Crambus.*
b^4. Thorax below and coxæ hairy ..... 5. *Orocrambus.*
b^2. Both wings with vein 3 absent..... 3. *Ptochostola.*
b^1. Hind wing with the upper margin of the cell remote from 8; fore wing with the apical area produced to a rounded prominence..... 23. *Mesolia.*
b. Fore wing with vein 7 absent ..... 4. *Culladia.*
‡ *c*. Fore wing with veins 7 and 10 from cell.
a^1. Palpi extending once to three times length of head.
a^2. Fore wing with veins 6, 7 from cell.
a^3. Frons rounded and not prominent.
a^4. Proboscis well developed; palpi with the 3rd joint clothed with hair.
a^5. Hind wing with veins 4, 5 from a point. 8. *Platytes.*
b^5. Hind wing with veins 4, 5 well separated at origin ..... 7. *Diptychophora.*

* Except in *Culladia* and *Mesolia apistrigella*.
† In *Mesolia apistrigella* vein 7 of the fore wing is absent.
‡ In a few specimens of *Eschata* 7 is shortly stalked with 8, 9.

b^4. Proboscis absent or minute.
a^5. Palpi with the 3rd joint clothed with hair; antennæ of male bipectinate ..... 15. *Ubida.*
b^5. Palpi with the 3rd joint naked; antennæ of male not pectinated.
a^6. Palpi extending about twice the length of head, with a tuft of hair from below 1st joint ..... 17. *Chalcoëla.*
b^6. Palpi extending about the length of head, with tufts of hair below 1st and 2nd joints ..... 18. *Dicymolomia.*
b^3. Frons with a conical prominence.
a^4. Fore wing with vein 11 oblique.
a^5. Fore wing subtriangular; ♂ with a shallow fovea in cell ..... 9. *Eromene.*
b^5. Fore wing lanceiform, the costa arched towards apex ..... 10. *Canuza.*
b^4. Fore wing with vein 11 curved and approximated to 12, the apex produced and acute ..... 16. *Chilo.*
c^4. Fore wing with vein 11 becoming coincident with 12 ..... 14. *Diatræa.*
b^2. Fore wing with veins 6, 7 stalked ..... 11. *Stenochilo.*
b^1. Palpi not or hardly extending beyond the frontal projection.
a^2. Fore wing broad; veins 8, 9 from angle of cell. 20. *Eschata.*
b^2. Fore wing long and narrow; veins 6, 7 from angle of cell, 8, 9 from before angle ..... 21. *Doratopcras.*
d. Fore wing with veins 7, 8, 9, 10 stalked.
a^1. Palpi extending about one and a half times length of head .. .. 12. *Macrochilo.*
b^1. Palpi not extending beyond frontal projection ... 19. *Leucargyra.*
e. Fore wing with veins 8, 9, 10 stalked, 7 from cell; palpi about three times length of head ..... 13. *Erupa.*

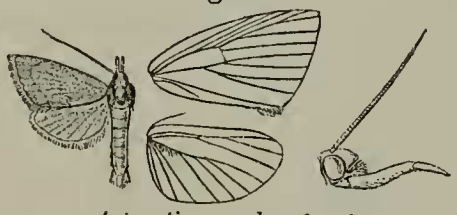
B. Hind wing with vein 6 from well below angle of cell and rudimentary, or absent.
a. Fore wing with the apical area produced to a rounded or hooked prominence ..... 24. *Prionopteryx.*
b. Fore wing with the apical area not produced.
a^1. Fore wing with veins 7 and 11 absent ..... 22. *Raphiptera.*
b^1. Fore wing with veins 7 and 11 present.
a^2. Fore wing with vein 7 from the cell.
a^3. Hind wing with vein 5 present.
a^4. Frons rounded or flat and not prominent.
a^5. Hind wing with veins 4, 5 shortly stalked, a tuft of raised scales at lower angle of cell ..... 30. *Gadira.*
b^5. Hind wing with veins 4, 5 from angle of cell.
a^6. Fore wing with vein 11 oblique; palpi with the 3rd joint naked; female with aborted wings ..... 29. *Scenoploca.*
b^6. Fore wing with vein 11 curved and approximated to 12; palpi with the 3rd joint clothed with hair; female with the wings fully developed ..... 28. *Charltona.*
b^4. Frons with a conical prominence ..... 27. *Talis.*
b^3. Hind wing with vein 5 absent ..... 25. *Suratha.*
b^2. Fore wing with vein 7 stalked with 8, 9 ..... 26. *Ancylolomia.*

Genus Autarotis.

Autarotis, Meyr. Trans. Ent. Soc. 1886, p. 269.

Palpi extending about three times the length of head and thickly clothed with hair; maxillary palpi triangularly scaled; proboscis well developed; frons with a conical prominence; antennæ of male somewhat thickened and flattened; tibiæ smoothly scaled, the outer spurs about twice the length of inner. Fore wing with the apex somewhat acute; veins 2, 3 stalked; 4, 5 from angle of cell; 6 from below upper angle; 7, 8, 9 stalked; 10, 11 free: male with the inner margin fringed with long rough hair towards outer angle. Hind wing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Fig. 23.



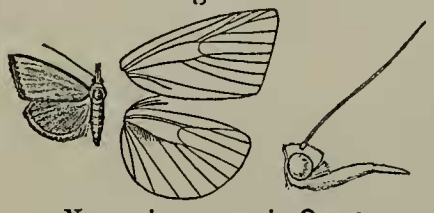
Autarotis euryala, ♂. ½.

Type. Autarotis euryala, Meyr. Trans. Ent. Soc. 1886, p. 207. Fiji.

Genus Neargyria, nov.

Palpi extending about three times length of head and clothed with hair; maxillary palpi triangularly scaled; proboscis well developed; frons with a conical prominence; antennæ of female nearly simple; tibiæ smoothly scaled, the spurs long. Fore wing with the apex produced and acute; vein 3 from before angle of cell; 4, 5 from angle; 6 from upper angle; 7, 8, 9 stalked; 10, 11 stalked. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Fig. 24.



Neargyria argyraspis, ♀. ½.

Type. Neargyria argyraspis, Meyr. P. Linn. Soc. N. S. W. 1879, p. 216. Australia.

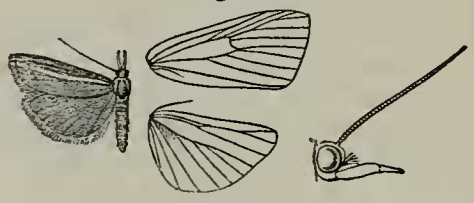
Genus Ptochostola.

Ptochostola, Meyr. P. Linn. Soc. N. S. W. vii. p. 154 (1882).

Palpi porrect, clothed with hair, and extending about twice the length of head; maxillary palpi triangularly scaled; proboscis well developed; frons rounded; antennæ of male thickened and flat-

tened; tibiæ with the spurs long. Fore wing with vein 3 absent; 4, 5 usually from angle of cell; 6 from below upper angle; 7, 8, 9 stalked; 10 free. Hind wing with vein 3 absent; 4, 5 from angle; 6, 7 from upper angle.

Fig. 25.



Ptochostola microphœella, ♂. ¾.

Sect. I. Fore wing with vein 11 becoming coincident with 12.

Type. (1)†Ptochostola microphœella, Wlk. xxxv. 1758. Australia.
Crambus dimidiellus, Meyr. P. L. Soc. N. S. W. 1878, p. 190.

Sect. II. Fore wing with vein 11 free.

A. Fore wing with veins 4, 5 from cell.

(2)†Ptochostola incanella, Zell. Hor. Ent. Ross. xvi. p. 50. Colombia.

B. Fore wing with veins 4, 5 stalked.

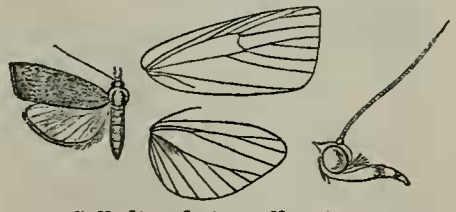
(3)†Ptochostola pygmæus, Zell. Hor. Ent. Ross. xvi. p. 173, pl. xi. f. 10. Colombia.

Genus Culladia.

Culladia, Moore, Lep. Ceyl. iii. p. 383.

Palpi porrect, thickly scaled, and extending about twice the length of head; maxillary palpi triangularly scaled; frons rounded; antennæ of male somewhat thickened and flattened; spurs long and equal. Fore wing long and narrow; vein 3 from angle of cell; 6 from below upper angle; 7 absent; 8, 9 stalked; 10, 11 free. Hind wing with vein 3 from near angle of cell; 6, 7 from upper angle.

Fig. 26.



Culladia admigratella, ♂. ¾.

Sect. I. Both wings with veins 4, 5 stalked.

Type. (1)†Culladia admigratella, Wlk. xxvii. 192; C. & S. no. 4686. China; Ceylon; Borneo.
†*Araxes œsella*, Wlk. xxvii. 193; C. & S. no. 4687.
Crambus troglodytellus, Snell. Tijds. Ent. (2) vii. p. 103, pl. 8. f. 6.

Sect. II. Both wings with veins 4, 5 coincident.

(2) Culladia suffusella, n. sp.

Head, thorax, and abdomen brownish fuscous. Fore wing fuscous; the costal area brownish; the veins beyond lower angle of cell streaked with fuscous; traces of a submarginal series of dark specks; a marginal series of dark specks, Hind wing pale, the costal and apical areas tinged with fuscous.

Hab. Madagascar; Nilgiris (*Hampson*). *Exp.* 20–26 mm.

Genus Orocrambus.

Orocrambus, Meyr. Tr. N. Z. Inst. xx. p. 67 (1885).

Palpi porrect, extending about the length of head and fringed with long hair below; maxillary palpi triangularly scaled; frons rounded; antennæ of female almost simple; thorax below and coxæ hairy; build stout; wings broad. Fore wing with the apex rounded; vein 3 from before angle of cell; 4, 5, from angle; 6 from upper angle; 7, 8, 9 stalked, or 9 free; 10, 11 free. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle; 7 anastomosing with 8 or free.

Fig. 27.

Orocrambus melampetrus, ♀. ½.

Type. (1) O. melampetrus, Purdie, N. Z. Journ. Sci. ii. p. 168. New Zealand.

(2) O. catacaustus, Meyr. Tr. N. Z. Inst. xvii. p. 134. New Zealand.

(3) O. tritonellus, Meyr. Tr. N. Z. Inst. xvii. p. 134. New Zealand.

Undetermined Species.

Orocrambus mylites, Meyr. Tr. N. Z. Inst. xx. p. 67. New Zealand.

Genus Crambus.

Crambus, Fabr. Ent. Syst. Suppl. p. 464 (1798).
Chrysoteuchia, Hübn. Verz. p. 366 (? 1818).
Thisanotia, Hübn. Verz. p. 367.
Exoria, Hübn. Verz. p. 367.
Carvanca, Wlk. ix. p. 119 (1856).
Calamotropha, Zell. Mon. Chil. & Cramb. p. 8 (1863).
Myeza, Wlk. xxvii. 190 (1863).

Arequipa, Wlk. xxvii. 195.
Propexus, Grote, Can. Ent. xii. p. 79 (1880).

Palpi porrect, extending about three times the length of head, and clothed with long hair; maxillary palpi triangularly dilated with hair; frons rounded; antennæ of male usually thickened and flattened, with appressed serrations; tibiæ with the outer spurs about half the length of inner. Fore wing with the apex acute; vein 3 from before angle of cell; 4, 5 usually from angle; 7, 8, 9 stalked; 10 free; 11 curved and approximated to or becoming coincident with 12. Hind wing with vein 3 from near angle of cell; 4, 5 from angle of cell or stalked.

Fig. 28.

Crambus nivellus, ♂. ½.

Sect. I. (*Propexus*). Antennæ of male bipectinate, with long branches.

(1)†Crambus edonis, Grote, Can. Ent. xi. p. 19. U.S.A.

(2)†Crambus pexellus, Zell. Mon. Chil. & Cramb. p. 48. U.S.A.

(3)†Crambus pectinifer, Zell. Hor. Ent. Ross. xiii. p. 53, pl. i. f. 20 *a*, *b*. U.S.A.

Sect. II. Antennæ of male strongly serrate.

4)†Crambus repandus, Grote, Can. Ent. xi. p. 79. Colorado.

Sect. III. (*Crambus*). Antennæ of male slightly thickened and flattened.

A. Fore wing with vein 7 given off further from the apex than 9.

a. Fore wing with vein 11 curved and approximated to 12.

a^1. Fore wing with veins 4, 5 from cell.

a^2. Palpi extending about twice the length of head.

(5)†Crambus tonsalis, Wlk. xxvii. 190. Borneo.

(6) Crambus dielota, Meyr. Trans. Ent. Soc. 1886, p. 268. Ceram; Australia; Fiji.

(7)†Crambus anticellus, Wlk. xxxv. 1751. Natal; Travancore; Ceylon; Pt. Darwin, Australia.

(8)†Crambus infixellus, Wlk. xxvii. 167. Japan; China.

(9) Crambus paludellus, Hübn. Europe.

(10)†Crambus hierochunticus, Zell. Palestine.

(11) Crambus leptogrammellus, Meyr. P. Linn. Soc. N. S. W. iv. p. 207. Australia.

(12)†Crambus delatalis, Wlk. xxvii. 176. Ceylon; Australia.

(13)†Crambus atkinsoni, Zell. Mon. Chil. & Cramb. p. 9. India; Ceylon; Burma; Borneo.

(14)†Crambus albistrigellus, n. sp.

♂. Head whitish, slightly suffused with brown; thorax pale reddish brown; abdomen whitish, slightly suffused with brown. Fore wing grey, irorated with brown; the costal area reddish brown; the cell, the veins beyond it, and the inner area prominently grey; a black discocellular speck; a brown spot at origin of vein 2; a marginal series of specks. Hind wing whitish, slightly suffused with brown.

Hab. Bonin Island, Perry's group. *Exp.* 24 mm.

(15) Crambus dividellus, Snell. Trans. Ent. Soc. 1890, p. 645. Sikhim.

(16) Crambus unicolorellus, Zell. Mon. Chil. & Cramb. p. 7.
† „ *abbreviatellus*, Wlk. xxxv. 1756. Punjab; Nilgiris.

(17)†Crambus violescentellus, n. sp.

Head and thorax pale ochreous; patagia purplish; abdomen whitish. Fore wing with the basal half of costa ochreous; the inner area ochreous white, with diffused black scales above it; the veins pale fulvous; an orange postmedial slightly sinuous line bent inwards to costa; a slightly sinuous submarginal orange line; a marginal series of black specks, sometimes complete, sometimes reduced to the medial four which are placed on an ochreous patch; cilia silvery. Hind wing pure white.

Hab. São Paulo; Castro Paraña, Brazil (*Jones*). *Exp.* 24–28 mm.

(18)†Crambus aurantilineellus, n. sp.

Head, thorax, and abdomen ochreous white. Fore wing purplish grey; a white streak from base along median nervure to outer margin; a diffused orange-yellow band below median nervure; orange postmedial and submarginal bands from the white streak to inner margin; a marginal series of black specks, the three below middle on an orange patch.

Hab. São Paulo, Brazil (*Jones*). *Exp.* 30 mm.

(19)†Crambus hemixanthellus, n. sp.

Head and thorax orange; abdomen whitish. Fore wing with the costal area dark rufous, merging into grey on outer area; the inner area orange, with two dark medial and two postmedial patches; a minutely dentate submarginal dark line outwardly edged with white towards inner margin; a marginal series of black specks; the cilia grey. Hind wing pure white.

Hab. São Paulo, Brazil (*Jones*). *Exp.* 26 mm.

(20)*Crambus alexandriensis, Baker, Trans. Ent. Soc. 1894, p. 48, pl. i. f. 19. Egypt.

(21)†Crambus tenuistrigatus, Zell. Hor. Ent. Ross. xvi. p. 168, pl. ii. f. 8. Trinidad; Colombia.

(22)†Crambus inornatellus, Wlk. xxvii. 157. Nova Scotia.

(23)†Crambus minuellus, Wlk. xxvii. 164. Colombia.

(24)†Crambus ligonellus, Zell. Hor. Ent. Ross. xvi. p. 170, pl. xi. f. 9. Jamaica.

(25) Crambus teterellus, Zinck. Germ. Mag. iv. p. 252. U.S.A.
„ *camurellus*, Clem. P. A. N. S. Phil. 1860, p. 203.
„ *terrellus*, Zell. Mon. Chil. & Cramb. p. 27.

(26)†Crambus cuneiferellus, Wlk. xxvii. 175. Australia; New Hebrides; Norfolk Island.

(27) Crambus combinellus, Schiff. Europe.

(28) Crambus coulonellus, Dup. Europe.

(29) Crambus spuriellus, Hübn. Europe.

(30)†Crambus diplogrammus, Zell. Mon. Chil. & Cramb. p. 25. Siberia; Japan.
„ *textellus*, Christ. Bull. Mosc. lvi. p. 48.
„ *argentistrigellus*, Leech, Entom. xxii. p. 107, pl. v. f. 11.

(31)*Crambus striatellus, Leech, Entom. xxii. p. 107, pl. v. f. 3. Japan.

(32) Crambus pudibundellus, H.-S. Europe.

(33) Crambus fascelinellus, Hübn. Europe.
„ *ramosellus*, Zell. Mon. Chil. & Cramb. p. 35.
„ *epineurus*, Meyr. Ent. Mo. Mag. xx. p. 141.

(34) Crambus digitellus, H.-S. Europe.

(35)†Crambus trisectus, Wlk. ix. 119. U.S.A.
† „ *exsiccalis*, Zell. Mon. Chil. & Cramb. p. 37.
† „ *interminellus*, Wlk. xxvii. 156.

(36)†Crambus undatus, Grote, Can. Ent. xvi. p. 35. U.S.A.

(37)†Crambus laciniellus, Grote, Can. Ent. xi. p. 18. U.S.A.

(38) Crambus caliginosellus, Clem. P. A. N. S. Phil. 1860, p. 203. U.S.A.

(39)†Crambus anceps, Grote, Can. Ent. xi. p. 18. U.S.A.

(40)†Crambus duplicatus, Grote, Can. Ent. xiii. p. 79. U.S.A.

(41) Crambus mutabilis, Clem. Proc. A. N. S. Phil. 1860, p. 204. U.S.A.
† „ *fuscicostellus*, Zell. Mon. Chil. & Cramb. p. 44.

(42)†Crambus profanellus, Wlk. xxxv. 1753. Jamaica.

(43)†Crambus fissiradiellus, Wlk. xxvii. 160. W. Indies.
† „ *curtellus*, Wlk. xxvii. 160. Colombia; Argentina.
† „ *quadrinotellus*, Zell. Hor. Ent. Ross. xiii. p. 55, pl. i. f. 21.

(44) Crambus luteolellus, Clem. Proc. A.N.S. Phil. 1860, p. 203.
† „ *hemiochrellus*, Zell. Ex. Micr. p. 49. U.S.A.
„ *ulæ*, Cockerell, Ent. Mo. Mag. xxiv. p. 272.

(45)†Crambus bizonellus, n. sp.

♂. Yellowish brown. Fore wing with the inner area suffused with dark brown; a narrow obliquely curved medial red-brown band; a similar minutely dentate postmedial band; a marginal series of black specks; cilia fuscous. Hind wing fuscous.

Hab. Valparaiso (*J. J. Walker*). *Exp.* 24 mm.

(46)†Crambus decolorellus, Wlk. xxvii. 164. Cape.
† „ *figuratellus*, Wlk. xxxv. 1754.

(47)†Crambus fulvitinctellus, n. sp.

♂. Head and thorax ochreous; palpi fulvous at sides; abdomen fuscous. Fore wing ochreous, with a fulvous tinge and irrorated with fuscous; the costal and outer areas fuscous; very ill-defined oblique medial and postmedial bands from costal area to inner margin; an indistinct curved submarginal line. Hind wing pale fuscous; the cilia whitish.

Hab. Amshaw, S. Africa. *Exp.* 24 mm.

(48) Crambus acutangulus, H.-S. Europe.

(49)†Crambus paleatellus, Zell. Europe.

(50) Crambus trabeatellus, H.-S. Sicily.

(51) Crambus inquinatellus, Schiff. Europe.

(52)*Crambus subflavellus, Dup. Europe.

(53)*Crambus osellus, Staud. Europe.

(54) Crambus atlanticus, Wollaston, A. M. N. H. (3) i. p. 119. Madeira.
„ var. *canariensis*, Rebel. Ann. Hofmus. Wien, vii. p. 254, pl. xvii. ff. 11, 12. Canaries.

(55) Crambus tersellus, Led. Europe.

(56) Crambus desertellus, Led. Europe.

(57)*Crambus grammiculellus, Lucas, Explor. Algérie, iii. p. 407, pl. 4. f. 8. Algiers.

(58) Crambus geniculeus, Haw. Europe; Japan.

(59) Crambus contaminellus, Hübn. Europe.
„ *cantiellus*, Tutt, Ent. xix. p. 52.

(60) Crambus salinellus, Tutt. Ent. xix. p. 52. England.

(61) Crambus matricellus, Treit. Europe.

(62) Crambus poliellus, Treit. Europe.

(63) Crambus deliellus, Hübn. Europe.

(64) Crambus lithargyrellus, Hübn. Europe.

(65) Crambus tristellus, Fabr. Europe.

(66) Crambus selasellus, Hübn. Europe.

(67) Crambus luteellus, Schiff. Europe.

(68)†Crambus zermattensis, Frey. Europe.

(69) Crambus lævigatus, Led. Europe.

(70) Crambus perlellus, Scop. Europe.
† „ *languidellus*, Zell. Mon. Chil. & Cramb. p. 49.

(71) Crambus aureliellus, F. R. Europe.

(72) Crambus saxonellus, Zinck. Europe.

(73) Crambus fulgidellus, Hübn. Europe.

(74) Crambus latistrius, Haw. Europe.

(75) Crambus unistriatellus, Pack. Proc. B. S. N. H. ii. 32. U.S.A.
† „ *exesus*, Grote, Can. Ent. xi. 16.

(76)†Crambus xiphiellus, Zell. S. e. Z. 1872, p. 467, pl. 2. f. 1. Bogotá.

(77)†Crambus falklandicellus, n. sp.

Pale golden brown; palpi white below. Fore wing with a white streak along basal half of costa, and a somewhat broad fascia from base through the cell to outer margin below apex. Hind wing somewhat paler.

Hab. Falkland Islands. *Exp.* 28 mm.

(78)†Crambus falcarius, Zell. S. e. Z. 1872, p. 469, pl. 2. f. 2. Bogotá.

(79) Crambus euryptellus, Berg, Ann. Soc. Argent. iv. p. 208. Argentina; Patagonia.

(80)†Crambus straminellus, n. sp.

♂. Brownish ochreous; palpi fuscous, white below. Fore wing with two medial brown lines from vein 1 to inner margin; a few brown scales on the outer part of inner area; an indistinct submarginal brown line highly angled at vein 6; a short oblique line from apex which is produced to a point; three or four marginal black specks. Hind wing ochreous white.

Hab. Valparaiso (*J. J. Walker*). *Exp.* 26 mm.

(81)†Crambus chillanicus, Butl. Trans. Ent. Soc. 1883, p. 61. Chili.

(82)†Crambus radicellus, n. sp.

♂. Golden brown. Fore wing with a somewhat broad white fascia below costa forking towards apex; a similar fascia through the cell with a longer fork before outer margin, and a streak between it and the subcostal fascia; a dark line on apical part of margin and three specks on medial part; the inner area greyish. Hind wing pale brown.

Hab. Patagonia (*J. J. Walker*). *Exp.* 30 mm.

(83)†Crambus fernandesellus, n. sp.

♂. Pale ochreous; thorax suffused with brown; abdomen whitish. Fore wing with brown streaks on base of costa; brown streaks below end of subcostal nervure and below the veins beyond the cell; a white streak ou median nervure and a brown fascia below it; some brown suffusion on inner area. Hind wing whitish, with slight fuscous suffusion.

Hab. Juan Fernandez (*J. J. Walker*). *Exp.* 30 mm.

(84)†Crambus spiculellus, Zell. Hor. Ent. Ross. xiii. p. 35, pl. i. f. 14. Argentina.

(85)†Crambus diatræellus, n. sp.

Brownish ochreous. Fore wing with black specks on discocellulars and on vein 2 near origin; the veins and interspaces of outer area streaked with brown; two fine brown lines just inside the margin and a fine marginal black line; the apex produced and acute. Hind wing pale fuscous.

Hab. Cayenne; Goya, Argentina. *Exp.* ♂ 28, ♀ 36 mm.

(86)†Crambus vapidus, Butl. P. Z. S. 1877, p. 399. New Zealand.

(87) Crambus decrenellus, Meyr. N. Z. Journ. Sci. i. p. 186. New Zealand.

(88) Crambus crenœus, Meyr. Tr. N. Z. Inst. xvi. p. 135. New Zealand.

(89) Crambus haplotomus, Meyr. N. Z. Journ. Sci. i. p. 187. New Zealand.

(90) Crambus pedias, Meyr. Trans. N. Z. Inst. xvii. p. 137. New Zealand.

(91) Crambus encophorus, Meyr. Trans. N. Z. Inst. xvii. p. 136. New Zealand.

(92)†Crambus vitellus, Doubl. Dieff. New Zeal. ii. p. 289. New Zealand.

† „ *transcissalis*, Wlk. xxvii. 178.

† „ *sublicellus*, Zell. Mon. Chil. & Cramb. p. 31.

(93)†Crambus ramosellus, Doubl. Dieff. New Zeal. ii. p. 288. New Zealand.

„ *rangona*, Feld. Reis. Nov. pl. 137. f. 25.

(94)†Crambus angustipennis, Zell. Hor. Ent. Ross. xiii. p. 15. New Zealand

† „ *leucanialis*, Butl. P. Z. S. 1877, p. 401.

(95)†Crambus bisectellus, Zell. Mon. Chil. & Cramb. p. 32. New Zealand.

† „ *incrassatellus*, Zell. Mon. Chil. & Cramb. p. 32.

† „ *nexalis*, Wlk. xxvii. 178.

(96)†Crambus flexuosellus, Doubl. Dieff. New Zeal. ii. p. 289. New Zealand.

(97) Crambus tuhualis, Feld. Reis. Nov. pl. 137. f. 18. New Zealand.

† „ *vulgaris*, Butl. P. Z. S. 1877, p. 400, pl. 43. f. 7.

(98) Crambus xanthogrammus, Meyr. N. Z. Journ. Sci. i. p. 187. New Zealand.

(99)*Crambus harpophorus, Meyr. N. Z. Journ. Sci. i. p. 187. New Zealand.

(100)†Crambus corruptus, Butl. P. Z. S. 1877, p. 399. New Zealand.

(101) Crambus heliotis, Meyr. Tr. N. Z. Inst. xx. p. 68. New Zealand.

(102) Crambus cyclopicus, Meyr. N. Z. Journ. Sci. i. p. 187. New Zealand.

(103) Crambus radiellus, Hübn. Europe.

(104) Crambus furcatellus, Zett. Europe.

(105) Crambus margaritellus, Hübn. Europe.

(106) Crambus pyramidellus, Treit. Europe.

(107) Crambus pauperellus, Treit. Europe.

(108) Crambus conchellus, Schiff. Europe.

(109) Crambus pinellus, Linn. Europe.

(110) Crambus mytilellus, Hübn. Europe.

(111) Crambus myellus, Hübn. Europe.

(112)†Crambus latiradiellus, Wlk. xxvii. 157. U.S.A.

† „ *interruptus*, Grote, Can. Ent. ix. p. 101.

(113) Crambus speculalis, Hübn. Europe.

(114) Crambus luctiferellus, Hübn. Europe.

(115)*Crambus dimorphellus, Staud. Hor. Ent. Ross. xvi. p. 21. Europe.

(116)*Crambus corsicellus, Dup. Europe.

(117)*Crambus kobelti, Saalm. S. e. Z. xlvi. p. 335. f. 12. Algeria.

(118) Crambus incertellus, H.-S. Europe.
„ *confusellus*, Staud. Hor. Ent. Ross. xvi. p. 82.

(119) Crambus verellus, Zinck. Europe.

(120) Crambus falsellus, Schiff. Europe.

(121) Crambus trichostomus, Christ. Europe; Labrador; Canada.

(122) Crambus labradoriensis, Christ. Ent. Zeit. xix. p. 314. Labrador; Canada.
† „ *mœstellus*, Wlk. xxvii. 155.

(123) Crambus truncatellus, Zett. Europe; Canada.
† „ *abtrusellus*, Wlk. xxvii. 158.
†*Hypena rufinalis*, Wlk. xxxiv. 1133.
†*Crambus licnigiellus*, Zell.

(124)†Crambus mixtalis, Wlk. xxvii. 166. China.

(125)†Crambus maculalis, Zett. Europe.
† „ *cacuminellus*, Zell.

(126) Crambus biarmicus, Tgstn. Europe.

(127) Crambus elegans, Clem. Proc. A. N. S. Phil. 1860, p. 204. U.S.A.
† „ *terminellus*, Zell. Mon. Chil. & Cramb. p. 27.

(128)†Crambus grisetinctellus, n. sp.

♂. Greyish white; thorax and abdomen suffused with brown. Fore wing sparsely irrorated with brown scales; the costa brown; brown specks on discocellulars and below origin of vein 2; an ill-defined diffused brown submarginal line becoming obsolescent towards inner margin; a marginal series of dark specks. Hind wing white, with a slight fuscous tinge. Underside of fore wing suffused with fuscous.

Hab. Petropolis, Brazil. *Exp.* 16 mm.

(129)†Crambus expansellus, Zell. Hor. Ent. Ross. 1877, pl. i. f. 18. Colombia.

(130)†Crambus immunellus, Zell. S. e. Z. 1872, p. 472, pl. 2. f. 6. Colombia; Brazil.

(131)†Crambus pusionellus, Zell. Mon. Chil. & Cramb. p. 16. Colombia; Venezuela.

(132)†Crambus sparsellus, Wlk. xxxv. 1755. S. Africa.

(133)†Crambus œnescentellus, n. sp.

♂. Head white; base of palpi and antennæ brown; thorax

brown, the patagia white; abdomen white. Fore wing white; an æneous fascia along basal two-thirds of costa, and broader fasciæ below median nervure and on inner margin; a fascia in end of cell, then bent upwards to apex; a series of marks in the interspaces beyond lower angle of cell; a marginal line. Hind wing white, the costal area with a slight æneous tinge.

♀ with the fore wing more wholly suffused with bronze.

Hab. N'gatana, Brit. E. Africa(*Gregory*). *Exp.* 16 mm.

(134)†Crambus famulellus, Wlk. xxxv. 1765. Ceylon; Burma; Tonkin.

(135)†Crambus dileucellus, n. sp.

♀. Golden brown. Fore wing with a diffused white fascia in the cell connected with a diffused triangular patch on the disk; a white mark on the disk and white mark on middle of inner area; a dentate white submarginal line bent inwards at costa; an irregular white band just inside the margin; a dark marginal line; the cilia pale and brown. Hind wing fuscous; the cilia white.

Hab. Sarawak, Borneo. *Exp.* 20 mm.

(136)†Crambus obliterans, Wlk. xxvii. 169. Borneo.
† ,, *candifer*, Wlk. xxvii. 170.

(137)†Crambus punctivenellus, n. sp.

♂. White; palpi fulvous at sides; thorax and abdomen irrorated with brown. Fore wing with the interspaces suffused with brown scales, leaving the base of cell and costal area whitish; a black spot at origin of vein 2; an oblique medial brown striga from costa; an indistinct submarginal brown line, double and very highly angled below the costa; a marginal black line somewhat maculate at the veins. Hind wing white.

Hab. Ceylon (*Green*); Tonkin (*Buckland*). *Exp.* 20 mm.

(138)†Crambus duplicellus, n. sp.

Silvery white; palpi at sides, antennæ, and legs fuscous. Fore wing with the costa dark brown; a brown medial line very much excurved below costa, then inwardly oblique, interrupted and emitting a streak below vein 2 to the double postmedial line, which is bent outwards from the costa to vein 6 and then becomes submarginal, and with some brown suffusion inside it on inner area; a dark marginal line. Underside of fore wing and costa of hind wing suffused with fuscous.

Hab. Haiphong, Tonkin (*Buckland*). *Exp.* 14 mm.

(139) Crambus chrysonuchellus, Scop. Europe.

(140) Crambus craterellus, Scop. Europe.

(141) Crambus lucellus, H.-S. Europe; Japan.

(142) Crambus hortuellus, Hübn. Europe; Japan.

(143) Crambus morrisonellus, Zell. U.S.A.

(144) Crambus decorellus, Zinck. Germ. Mag. iv. p. 256. U.S.A.
" *polyactinellus*, Zell. Mon. Chil. & Cramb. p. 25.
† " *goodellianus*, Grote, Can. Ent. xii. p. 17.
" *bonusculalis*, Hulst. Tr. Am. Ent. Soc. xiii. p. 167.

(145)† Crambus toparius, Zell. Stett. e. Z. 1866, p. 155. U.S.A.

(146)† Crambus ruricolellus, Zell. Mon. Chil. & Cramb. p. 40. U.S.A.

(147) Crambus vulgivagellus, Clem. Proc. A. N. S. Phil. 1860, p. 203. U.S.A.; Vancouver.
† " *chalybirostris*, Zell. Mon. Chil. & Cramb. p. 40.
† " *aurifimbrialis*, Wlk. xxvii. 157.

(148)† Crambus attenuatus, Grote, Can. Ent. xi. p. 18. W. States; Vancouver.

(149) Crambus culmellus, Linn. Europe.

(150) Crambus dumetellus, Hübn. Europe.

(151) Crambus palustrellus, Rag. Bull. Soc. Ent. Fr. (5) vi. p. 78. Europe.

(152) Crambus pratellus, Linn. Europe.

(153)† Crambus oregonicus, Grote, Can. Ent. xi. p. 17. U.S.A.

(154) Crambus alienellus, Zinck. Europe.

(155)† Crambus dissectus, Grote, Can. Ent. xii. p. 16. U.S.A.

(156) Crambus hemigiellus, H.-S. Europe.

(157) Crambus silvellus, Hübn. Europe.

(158) Crambus ericellus, Hübn. Europe.

Type. (159) Crambus pascuellus, Linn. Europe.

(160)† Crambus uliginosellus, Zell. Europe.

(161) Crambus hamellus, Thnb. Europe.

(162)† Crambus nolkeniellus, Zell. S. e. Z. 1872, p. 470, pl. 2. f. 4. Colombia; Bogota.

(163) Crambus candiellus, H.-S. Armenia.

(164) Crambus malacellus, Dup. Palæarctic, Æthiopian,
† " *hapaliscus*, Zell. Lep. Caffr. p. 7. Oriental, and
† " *concinellus*, Wlk. xxvii. 165. Australian regions.

(165)† Crambus quinquearealis, Zell. Ex. Micr. 38, pl. i. f. 16. U.S.A.

(166)†Crambus leuconotus, Zell. Hor. Ent. Ross. xvi. p. 167, pl. xi. f. 7. U.S.A.

(167) Crambus præfectellus, Zinck. Germ. Mag. iv. p. 249. U.S.A.
„ *involutellus*, Clem. Proc. A. N. S. Phil. 1860, p. 203.

(168) Crambus leachellus, Zinck. Germ. Mag. iv. p. 114. U.S.A.
† „ *pulchellus*, Zell. Mon. Chil. & Cramb. p. 18.
† „ *hastiferellus*, Wlk. xxvii. 155.

(169)†Crambus subæqualis, Zell. Hor. Ent. Ross. xiii. p. 37. Brazil; Argentina.

(170)†Crambus argyrophorus, Butl. Ill. Het. ii. p. 61, pl. 40. f. 5. Japan; Sikhim.

(171)*Crambus ornatellus, Leech, Entom. xxii. p. 108, pl. v. f. 2. Japan.

(172)*Crambus argentarius, Staud. Siberia.

(173) Crambus nivellus, Koll. Hüg. Kasch. iv. p. 495. Himalayas; Nilgiris.
† „ *todarius*, Butl. P. Z. S. 1883, p. 173.
„ *aurivittatus*, Moore, Lep. Atk. p. 226.

(174)†Crambus floridus, Zell. Beitr. i. 91. U.S.A.

(175) Crambus carpenterellus, Pack. Hayden's U.S. Survey, 1873, p. 548. Western States.
† „ *occidentalis*, Grote, Can. Ent. xii. p. 16.

(176) Crambus satrapellus, Zinck. Germ. Mg. iv. p. 247. U.S.A.
† „ *aculiellus*, Wlk. xxvii. 158.
† „ *elegantellus*, Wlk. xxvii. 179.

(177)†Crambus bidens, Zell. Beitr. i. 89. U.S.A.

(178) Crambus agitatellus, Clem. Proc. A. N. S. Phil. 1860, p. 203. U.S.A.
„ *alboclavellus*, Zell. Mon. Chil. & Cramb. p. 19.

(179)†Crambus saltuellus, Zell. Mon. Chil. & Cramb. p. 22. U.S.A.

(180) Crambus laqueatellus, Clem. Proc. A. N. S. Phil. 1860, p. 203. U.S.A.
† „ *semifusellus*, Wlk. xxvii. 159.

(181)†Crambus yokohamæ, Butl. A. M. N. H. (5) iv. p. 456. Amur; Jpan.
„ *splendidellus*, Christ. Bull. Mosc. lvi. p. 43.

(182) Crambus albellus, Clem. P. A. N. S. Phil. 1860, p. 204. U.S.A.

(183)†Crambus bipunctellus, Zell. Mon. Chil. & Cramb. p. 23. U.S.A.

†*Arequipa turbatella*, Wlk. xxvii. 196.

(184) Crambus porcellanellus, Motsch. Et. Ent. ix. p. 38. Japan.

† „ *vigens*, Butl. A. M. N. H. (5) iv. p. 456.
„ *fucatellus*, Christ. Bull. Mosc. lvi. p. 45.

(185)*Crambus mandschuricus, Christ. Bull. Mosc. lvi. p. 44. Amur.

(186)*Crambus distinctellus, Leech, Entom. xxii. p. 107, pl. v. f. 1. Japan.

(187)*Crambus purellus, Leech, Entom. xxii. p. 107, pl. v. f. 10. Japan.

(188) Crambus latellus, Snell. Trans. Ent. Soc. 1890, p. 644. Japan; Himalayas; Assam.

(189)†Crambus melanosticta, n. sp.

Differs from *latellus* in the palpi being white at tips. Fore wing with two oblique medial costal brown strigæ continued as a single medial line angled below costa, and with a black spot on it at vein 2; the submarginal line brown, further from the margin, double from the costa to its angle at vein 6 and incurved at vein 2; no orange on marginal area; a slight brown marginal line; the cilia silvery.

Hab. Nágas (*Doherty*); Ceylon (*Green*). *Exp.* 16–20 mm.

(190)*Crambus nigripunctellus, Leech, Entom. xxii. p. 107, pl. v. f. 10. Corea.

(191)†Crambus chrysoperellus, Hmpsn. A. M. N. H. (6) xvi. p. 349. Grenada; St. Vincent.

(192) Crambus oculalis, Snell. Tijd. Ent. xxxvi. p. 64, pl. 3. f. 6. Ceylon, Java.

(193)†Crambus argenticilia, n. sp.

♂. Pure silvery white; palpi tinged with fulvous at base. Fore wing with five pale fuscous, slightly sinuous, erect, medial lines; a similar submarginal line slightly excurved between veins 6 and 3; a black marginal line; cilia silvery.

Hab. Bhután (*Dudgeon*); Ceylon (*Green*). *Exp.* 16 mm.

(194)†Crambus auricinctalis, Wlk. xxvii. 183. W. Africa.

(195)†Crambus flavipedellus, Zell. Lep. Caffr. p. 73. S. Africa.

(196)†Crambus aurifimbriellus, n. sp.

♂. Silvery white; palpi fulvous at sides; legs pale fulvous. Fore wing with a blackish postmedial speck in interno-median interspace, with a slight ridge of white scales from it becoming

golden near the margin; a series of black striæ on the margin; the cilia pale fuscous. Underside of fore wing slightly suffused with fuscous.

Hab. Haiphong, Tonkin (*Buckland*). *Exp.* 18 mm.

(197) Crambus girardellus, Clem. P. A. N. S. Phil. 1860, p. 204. U.S.A.
† ,, *niveihumellus*, Wlk. xxvii. 159.

(198) Crambus nigrociliellus, Zell. Mon. Chil. & Cramb. p. 52. Bombay; Siberia; China; Japan;
† ,, *inclaralis*, Wlk. xxvii. 166. N.W. Himalayas.
† ,, *brachypterellus*, Wlk. xxxv. 1757.
,, *immaturellus*, Christ. Bull. Mosc. lvi. p. 48.

(199) Crambus nigricosta, Hmpsn. Ill. Het. viii. p. 143, pl. 156. f. 22. Nilgiris.

(200) Crambus inornatellus, Clem. Proc. Ent. Soc. Phil. ii. 418. U.S.A.
† ,, *sericinellus*, Zell. Mon. Chil. & Cramb. p. 49.
† ,, *innotatellus*, Wlk. xxvii. 156.

(201)† Crambus impurellus, n. sp.

♂. White, with a slight yellowish tinge and fuscous suffusion; underside of fore wing and the costal area of hind wing suffused with fuscous.

Hab. Gulmurg, Afghanistan (*Fortescue*). *Exp.* 24 mm.

*b*². Palpi hardly reaching beyond the frons, which is produced and conical.

(202)† Crambus sericina, Zell. Exot. Micr. p. 70. Colombia.

*b*¹. Fore wing with veins 4, 5 on a long stalk.

(203)† Crambus distictellus, n. sp.

Pale brown. Fore wing with the veins slightly delineated by fuscous lines; a black discocellular spot, with another spot below it on vein 2; a black speck at outer angle; two fine brown lines just inside the margin, and a blackish marginal line. Hind wing yellowish white, the apical area slightly suffused with brown, especially in male.

Hab. Brazil (*Schaus*). *Exp.* ♂ 24, ♀ 32 mm.

b. Fore wing with vein 11 anastomosing with 12; hind wing with veins 4, 5 stalked.

(204)† Crambus simplex, Butl. P. Z. S. 1877, p. 400, pl. 43. f. 12. New Zealand.

(205)† Crambus ochristrigellus, n. sp.

Ochreous. Fore wing with the interspaces irrorated with fuscous scales, forming obscure streaks from base to beyond

middle, and obscure postmedial and submarginal series of short streaks; two dark specks on the margin below middle; veins 4, 5 often stalked. Hind wing ochreous white.

Hab. Labore (*Harford*); Ceylon (*Pole*). *Exp.* 14–22 mm.

(206)†Crambus delineatellus, n. sp.

♂. Ochreous white; palpi at sides and patagia brown. Fore wing ochreous white; the veins pure white, with fine brown lines on each side of them; fine brown streaks in cell and interspaces below it; a black discocellular spot, a spot below origin of vein 2, and a spot at outer angle; two fine brown lines just inside the margin, and a series of black specks on the margin. Hind wing white.

Hab. Castro Paraña, Brazil (*Jones*). *Exp.* 22 mm.

B. Fore wing with vein 7 given off nearer the apex than 9.

(207)†Crambus multiradiellus, n. sp.

Head and thorax black-brown; palpi below, the sides of frons, antennæ, and metathorax white; abdomen greyish. Fore wing black-brown; a white fascia from base bifurcating at middle of cell, again dividing into three branches towards costa and three beyond lower angle of cell; a broad white fascia on inner area irrorated with black; a double fulvous line from costa beyond middle, oblique to below apex, then submarginal; a marginal series of black spots; the cilia silvery. Hind wing pure white.

Hab. São Paulo; Castro Paraña, Brazil (*Jones*). *Exp.* 26 mm.

(208)†Crambus argentilineellus, n. sp.

Head and thorax pale rufous; the patagia tinged with purple; abdomen pale, in some specimens with paired dark lateral patches. Fore wing pale ochreous brown, with broad whitish costal fascia with purple-brown stripe below it; a purple-brown streak below median nervure; pale streaks on the veins beyond the cell; the marginal area orange, with curved silvery submarginal line; a marginal series of black specks; the cilia silvery. Hind wing white with pale fuscous suffusion, chiefly on apical area.

Hab. São Paulo; Castro Paraña, Brazil (*Jones*). *Exp.* 28–32 mm.

List of undetermined Species.

Crambus argillaceus, Pack. Pr. Bost. Soc. N. H. xi. 54. Labrador.
„ *colchicellus*, Led. Armenia.
„ *lævigatellus*, Led. Armenia.
„ *inconspicuellus*, Snell. Tijds. Ent. (2) vii. p. 102, pl. 8. f. 5. Guinea.
Calamotropha robustella, Snell. Tijds. Ent. (2) vii. p. 100, pl. 8. ff. 2, 3. Guinea.
„ *abjectella*, Snell. Tijds. Ent. (2) vii. p. 101, pl. 8. f. 4. Guinea.

Crambus hcliocaustus, Wallengr. Œfv. Ak. Förh. xxii. 1, p. 126. S. Africa.
„ *recalvus*, Wallengr. Œfv. Ak. Förh. xxii. 1, p. 126. S. Africa.
„ *stilatus*, Zell. Hor. Ent. Ross. xiii. p. 38, pl. i. f. 15. Argentina.
„ *humidellus*, Zell. Hor. Ent. Ross. xiii. p. 42. Japan.
„ *atrosignatus*, Zell. Hor. Ent. Ross. xiii. p. 43, pl. i. f. 17. Japan.
„ *caucasicus*, Alph. Troudy. Ent. Ross. x. p. 27. Caucasus.
„ *leuconotus*, Zell. Hor. Ent. Ross. xvi. p. 167, pl. xi. f. 7. Colombia.
„ *æthonellus*, Meyr. N. Z. Jn. Sci. i. p. 187. New Zealand.
„ *callirhous*, Meyr. N. Z. Jn. Sci. i. p. 187. New Zealand.
„ *siriellus*, Meyr. N. Z. Jn. Sci. i. p. 187. New Zealand.
„ *dimidiatellus*, Grote, Tr. Kansas Ac. viii. p. 57. U.S.A.
„ *graphellus*, Cons. Ann. Soc. Fr. (6) iv. p. 207, pl. ix. f. 5. Gulf of Juan.
„ *ephorus*, Meyr. Trans. N. Z. Inst. xvii. p. 135. New Zealand.
„ *diplorrhous*, Meyr. Trans. N. Z. Inst. xvii. p. 136. New Zealand.
„ *paraxenus*, Meyr. Trans. N. Z. Inst. xvii. p. 137. New Zealand.
„ *sophronellus*, Meyr. Trans. N. Z. Inst. xvii. p. 138. New Zealand.
„ *oncolobus*, Meyr. Trans. N. Z. Inst. xvii. p. 138. New Zealand.
„ *zeellus*, Fernald, Can. Ent. xvii. p. 55=*refotalis*, Hulst. Tr. Am. Ent. Soc. xiii. p. 166. U.S.A.
„ *hulstellus*, Fernald, Can. Ent. xvii. p. 56. U.S.A.
„ *biradiellus*, Mab. Bull. Soc. Philom. (7) ix. p. 70. Magellan.
„ *concolorellus*, Christ. Rom. Mem. ii. p. 149, pl. viii. f. 15. Transcaucasia.
„ *terrestellus*, Christ. Rom. Mem. ii. p. 151, pl. viii. f. 2. Transcaucasia.
„ *extorralis*, Hulst, Tr. Am. Ent. Soc. xiii. p. 165. U.S.A.
„ *trichusalis*, Hulst, Tr. Am. Ent. Soc. xiii. p. 165. U.S.A.
„ *cypridalis*, Hulst, Tr. Am. Ent. Soc. xiii. p. 165. U.S.A.
„ *delectalis*, Hulst, Tr. Am. Ent. Soc. xiii. p. 165. U.S.A.
„ *offectalis*, Hulst, Tr. Am. Ent. Soc. xiii. p. 166. U.S.A.
„ *cuneolalis*, Hulst, Tr. Am. Ent. Soc. xiii. p. 166. U.S.A.
„ *biothanatalis*, Hulst, Tr. Am. Ent. Soc. xiii. p. 166. U.S.A.
„ *gausapalis*, Hulst, Tr. Am. Ent. Soc. xiii. p. 167. U.S.A.
„ *comptulatalis*, Hulst, Tr. Am. Ent. Soc. xiii. p. 167. U.S.A.
„ *cyrenaicellus*, Rag. Bull. Soc. Ent. Fr. (6) vii. p. 138. Tunis.
„ *profluxellus*, Rom. Mem. iii. p. 45, pl. ii. f. 13. Transcaucasus.
„ *bolterellus*, Fern. Ent. Am. iii. p. 37. Texas.

Crambus multilinellus, Fern. Ent. Am. iii. p. 37. Florida.
„ *behrensellus*, Fern. Ent. Am. iii. p. 37. California.
„ *divisellus*, Johannis, Ann. Soc. Ent. Fr. (6) viii. p. 273, pl. vi. f. 4. Beyrout.
„ *vallicolellus*, Casto, Atti Ac. Napoli, (2) i. no. 9, p. 60. Sardinia.
„ *argentistrigellus*, Rag. Ann. Soc. Ent. Fr. (6) viii. p. 279, pl. vi. f. 9. Algeria.
„ *isochytus*, Meyr. Tr. N. Z. Inst. xx. p. 68. New Zealand.
„ *detomatellus*, Möschl. Abh. Senck. Ges. xvi. p. 322. Porto Rico.
„ *descludellus*, Möschl. Abh. Senck. Ges. xvi. p. 323. Porto Rico.
„ *gestatellus*, Möschl. Abh. Senck. Ges. xvi. p. 323. Porto Rico.
„ *psychellus*, Maassen in Stübel's Reise, p. 171, pl. ix. f. 24. Equador.
„ *angustatellus*, Maassen in Stübel's Reise, p. 171, pl. ix. f. 28. Bolivia.
Propexus magnificus, Fern. Can. Ent. xxiii. p. 30. Texas.
Crambus biformellus, Rebel. Stett. e. Z. liv. p. 37. Transcaucasia.
„ *ciliciellus*, Rebel. Stett. e. Z. liv. p. 39. Armenia.
„ *albilinellus*, Fern. Can. Ent. xxv. p. 94. California.
„ *coloradellus*, Fern. Can. Ent. xxv. p. 95. Colorado.
Calamotropha argenteociliella, Pag. Jahrb. Hamb. Anst. x. p. 286. E. Africa.
„ *fuscicostella*, Snell. Tijd. Ent. xxiii. p. 247. Celebes.
Crambus orientellus, H.-S. Europe.
„ *kindermanni*, Zell. Mon. Chil. & Cramb. p. 37. Siberia.
„ *italellus*, Cast. Europe.
„ *siculellus*, Dup. Europe.
„ *œniociliellus*, Ev. Europe.
„ *monotœniellus*, H.-S. Europe.
„ *vectifer*, Zell. Europe.
„ *delicatellus*, Zell. Europe.
„ *staudingeri*, Zell. Europe.
„ *permutatellus*, H.-S. Europe.
„ *nemorellus*, Hübn. Europe.

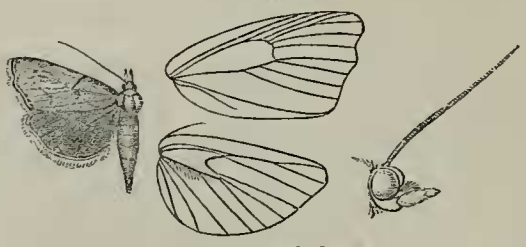
Genus Diptychophora.

Diptychophora, Zell. Stett. ent. Zeit. 1866, p. 153.
Ditomoptera, Hmpsn. Ill. Het. ix. p. 179 (1893).

Palpi porrect, clothed with long hair and extending about the length of head; maxillary palpi triangularly scaled; proboscis well-developed; frons rounded; antennæ of male somewhat thickened and flattened; tibiæ with the spurs long and equal. Fore wing with the outer margin deeply excised below apex and slightly at vein 5; vein 3 from near angle of cell; 4, 5 from angle; 7 straight and well separated from 8, 9; 10 free; 11 free or

becoming coincident with 12. Hind wing with veins 3, 4 from angle of cell, rarely absent; 5 from well above angle; 6, 7 from upper angle.

Fig. 29.



Diptychophora lepidella, ♂. ⅔.

Sect I. Hind wing with vein 3 present in both sexes.

(1)†Diptychophora lepidella, Wlk. xxxv. 1761. New Zealand.
Crambus gracilis, Feld. Reis. Nov. pl. 127. f. 26.

(2)*Diptychophora interrupta, Feld. Reis. Nov. pl. 135. f. 15.
„ *atrosema*, Meyr. N. Z. Journ. Sci. i. 186.
New Zealand.

(3)*Diptychophora holanthos, Meyr. Tr. N. Z. Inst. xvii. 131.
New Zealand.

(4)†Diptychophora auriscriptella, Wlk. xxx. 976.
New Zealand.

(5)†Diptychophora metallifera, Butl. P. Z. S. 1877, p. 401, pl. 43. f. 11. New Zealand.

(6)†Diptychophora bipunctella, Wlk. xxxv. 1761. New Zealand.

(7) Diptychophora pyrsophanes, Meyr. N. Zeal. Journ. Sci. i. p. 186. New Zealand.

(8)*Diptychophora chrysoclyta, Meyr. Trans. N. Z. Inst. 1882, p. 12. New Zealand.

(9) Diptychophora selenæa, Meyr. Tr. N. Z. Inst. xvii. 131.
New Zealand.

(10) Diptychophora elaina, Meyr. N. Z. Journ. Sci. i. 187.
New Zealand.

(11)*Diptychophora epiphæa, Meyr. Tr. N. Z. Inst. xvii. 132.
New Zealand.

(12) Diptychophora adspersella, Snell. Tijd. v. Ent. xxxvi. p. 61, pl. 3. f. 4. N.W. Himalayas; Ceylon.

(13) Diptychophora tripunctata, Moore, Lep. Atk. p. 226.
Sikhim.

(14)†Diptychophora minutella, Hmpsn. Ill. Het. ix. p. 179, pl. 174. f. 31. Sikhim; Ceylon.

(15)†Diptychophora griseolalis, n. sp.

♀. Whitish, thickly irrorated with brown. Fore wing with the costa pale fulvous at middle; an antemedial white line with dark line on its outer edge and angled below costa; a slight yellowish discocellular spot; a postmedial line highly excurved below costa, then oblique, crenulate, and with white spots on its outer edge to inner margin; the apical area yellow with a white fascia; a dark line through the cilia.

Hab. Jubbulpore, Bengal. *Exp.* 14 mm.

(16)†Diptychophora parvalis, Wlk. xxxiv. 1316. Brazil.

(17)*Diptychophora azanalis, Wlk. xix. 967. Brazil.

Type. (18)*Diptychophora kuhlweinii, Zell. Stett. ent. Zeit. 1866, p. 154, pl. i. f. 13. Brazil.

Sect. II. Hind wing with vein 3 present in ♂, absent in ♀.

(19)†Diptychophora ochracealis, Wlk. xxxv. 1338. Australia.

,, *prematurella*, Meyr. P. L. Soc. N. S. W. 1878, p. 198.

Sect. III. Hind wing with vein 3 absent in both sexes.

(20) Diptychophora dilatella, Meyr. P. L. Soc. N. S. W. 1878, p. 199. Australia.

List of undetermined Species.

Diptychophora straminiella, Zell. Hor. Ent. Ross. xiii. 32, pl. i. f. 12. New Friburg.

,, *octavianella*, Zell. Hor. Ent. Ross. xiii. 33, pl. i. f. 13. Chiriqui.

,, *leucoxantha*, Meyr. N. Z. Journ. Sci. i. p. 186. New Zealand.

,, *helioctypa*, Meyr. N. Z. Journ. Sci. i. p. 187. New Zealand.

,, *harmonica*, Meyr. Tr. N. Z. Inst. xx. p. 71. New Zealand.

,, *exsectella*, Christ, Bull. Mosc. lvi. p. 41. Amur.

Genus Platytes.

Platytes, Guen. Ind. Meth. p. 86 (1845).
Argyria, Hübn. Verz. p. 372 (? 1818), non descr.
Catharylla, Zell. Mon. Chil. & Cramb. p. 50 (1863).
Urola, Wlk. xxvii. 181 (1863).
Ptychopseustis, Meyr. Trans. Ent. Soc. 1889, p. 521.

Palpi porrect, downcurved at extremity, reaching well beyond the frons and clothed with hair; maxillary palpi triangularly scaled; proboscis well developed; frons rounded; antennæ of male thickened and flattened. Fore wing with vein 3 from before

angle of cell; 4, 5 from angle; 6 from well below upper angle; 7 from angle; 8, 9 stalked; 10 and 11 free and oblique. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Fig. 30.

Platytes niveifascialis, ♂. ½.

Sect. I. (*Argyria*). Palpi extending about 1½ times length of head.

(1) Platytes nivalis, Drury, ii. pl. xiv. f. 4. U.S.A.; Honduras.
Geometra argentata, Emmons, Nat. Hist. New York, v. pl. 40. f. 2.
†*Catharylla nummulalis*, Zell. Mon. Chil. & Cramb. p. 51.
†*Urola microchrysella*, Wlk. xxvii. 181.

(2) Platytes nummulalis, Hübn. Exot. ff. 185, 186. U.S.A.
†*Catharylla fuscipes*, Zell. Mon. Chil. & Cramb. p. 51.
†*Urola subœnescens*, Wlk. xxvii. 182.

(3)†Platytes tenella, Zell. Mon. Chil. & Cramb. p. 50. Brazil.

(4)†Platytes lucidella, Zell. Mon. Chil. & Cramb. p. 52. Brazil.

(5)†Platytes rufisignella, Zell. Grote's Check List, p. 56. U.S.A.

(6)†Platytes opposita, Zell. Hor. Ent. Ross. xiii. p. 64. Centr. & S. America.
Argyria insons, Feld. Reis. Nov. pl. 137. f. 21.

(7) Platytes pusillalis, Hübn. Zutr. 167, 168. U.S.A.; W. Indies; Centr. & S. America.
Zebronia abronalis, Wlk. xix. 967.
†*Catharylla lusella*, Zell. Mon. Chil. & Cramb. p. 51.
†*Argyria vestalis*, Butl. P. Z. S. 1878, p. 494.

(8)†Platytes pustulella, Wlk. xxxv. 1764. Venezuela.

(9)†Platytes divisella, Wlk. xxxv. 1765. Centr. & S. America.
†*Argyria pontiella*, Zell. Hor. Ent. Ross. xiii. p. 61, pl. i. f. 24.

(10)†Platytes croceivitella, Wlk. xxvii. 182. Brazil.

(11)†Platytes simplex, Zell. Hor. Ent. Ross. xiii. p. 70. Centr. America.

(12) Platytes furvicornis, Zell. Hor. Ent. Ross. xiii. p. 68. Brazil.

SECT. II. (*Platytes*). Palpi extending more than twice the length of head.

A. Fore wing with the apex slightly produced.

a. Fore wing with the outer margin not indented.

(13)†PLATYTES CROCEICINCTELLA, Wlk. xxvii. 182. Venezuela.

(14) PLATYTES AURATELLA, Clem. Proc. A. N. S. Phil. 1860, p. 204.
†*Urola pulchella*, Wlk. xxvii. 183. U.S.A.

(15)†PLATYTES INTERRUPTELLA, Wlk. xxxv. 1763.
Japan; China; Penang.
†*Argyria inficitella*, Wlk. xxxv. 1764.
,, *obliquella*, Zell. Hor. Ent. Ross. xiii. p. 68, pl. i. f. 22.
† ,, *candida*, Butl. Trans. Ent. Soc. 1881, p. 590.

(16)†PLATYTES MARGINEPUNCTALIS, n. sp.

Pure white; palpi rufous at sides; collar with two rufous lines. Fore wing with slight rufous streaks from base along costa, median nervure, and vein 1; a medial rufous line very highly angled below costa, and with a black discocellular spot on it; a double submarginal rufous line highly angled on vein 6, its outer portion indistinct and minutely crenulate near the angle; a marginal series of black specks; the cilia silvery at base, the tips fuscous. Hind wing pure white. Underside of fore wing suffused with fuscous.
Hab. Dharmsála, Punjab (*Hocking*). *Exp.* 18 mm.

(17)†PLATYTES PARALELLUS, Zell. Stett. e. Z. 1867, p. 389, pl. 2. f. 1. Sikhim; Khásis.

(18)†PLATYTES NIVEIFASCIALIS, n. sp.

♂. Head white; palpi brown at sides; thorax white and brown; abdomen ochreous white. Fore wing pale ochreous brown, with silvery-white fascia from base through the cell, terminating in a point beyond the cell and edged by brown lines; some dark brown scales on inner area; a brown line from costa beyond middle, double to vein 6, where it is highly angled near the margin, then inwardly oblique, sinuous and obsolescent; a fuscous triangular shade on outer area meeting the apex of the silvery fascia; a fine dark crenulate marginal line. Hind wing ochreous white, slightly tinged with fuscous on marginal area.
Hab. Nilgiris, S. India (*Hampson*). *Exp.* 22 mm.

(19)†PLATYTES INTERSTRIATELLUS, n. sp.

♂. White; palpi rufous at sides; the thorax marked with rufous; abdomen brownish. Fore wing with the interspaces suffused with rufous; the veins white; a blackish patch below base of cell and a streak on base of inner margin; an ill-defined very oblique white band from lower angle of cell to inner margin, with blackish

patches beyond discocellulars and below cell; an oblique submarginal white line from vein 3 to inner margin; a series of blackish submarginal marks. Hind wing whitish.

Hab. Dharmsála, Punjab (*Hocking*). *Exp.* 24 mm.

(20)†Platytes strigulalis, n. sp.

♂. White; palpi fuscous at sides; abdomen with the two basal segments yellow above. Fore wing with oblique yellow-brown strigæ from costa; slight brown streaks below costa and in cell; the inner area irrorated with a few brown scales and with traces of a medial oblique line; a dark discocellular speck; the outer area prominently streaked with yellow-brown; an indistinct waved submarginal line bent inwards to costa and inner margin; a marginal series of black specks. Hind wing white.

Hab. Murree; Mean Meer, Punjab (*Harford*); Nágas, Assam (*Doherty*); Ceylon (*Green*). *Exp.* 20 mm.

(21)†Platytes albipennella, n. sp.

♂. Cretaceous white; palpi brownish at sides; abdomen with the two basal segments ochreous above. Fore wing with traces of pale fulvous streaks in the interspaces and of a pale fulvous spot at lower angle of cell; a marginal series of dark specks; cilia with three brown lines through them. Hind wing pure white.

Hab. Murree, Punjab (*Harford*). *Exp.* 18 mm.

(22) Platytes squamulella, Zell. Hor. Ent. Ross. 1881, p. 158, pl. xi. f. 3. U.S.A.

(23) Platytes densella, Zell. Hor. Ent. Ross. 1881, p. 158, pl. xi. f. 2. U.S.A.

(24) Platytes interlineata, Zell. Hor. Ent. Ross. 1881, p. 156, pl. xi. f. 1. Colombia.

(25) Platytes pulverulentella, Zell. S. e. Z. 1870, p. 473, f. 7. Bogotá.

(26) Platytes pallidella, Dup. Europe.

(27)†Platytes polyactinella, n. sp.

Pure white; palpi brown at sides; fore legs brown. Fore wing with very broad brown fascia from base through the cell to outer margin below apex, streaks along medial nervure, the veins beyond the cell, in interno-median interspace and on vein 1; a series of black marginal specks; cilia with brown bases and tips. Hind wing white.

Hab. Castro Paraña, Brazil (*Jones*). *Exp.* 26 mm.

(28)†Platytes sagitella, n. sp.

♂. Head, thorax, and abdomen golden bronze; the patagia and abdomen marked with white. Fore wing golden bronze; a white

fascia on costal area not reaching the apex; a white fascia from base below cell to middle of wing, with black on its upper edge, continued as a white streak on vein 1, and emitting an angled white mark to middle of inner margin; a black-edged oblique white band from below apex, sending a sagittate white mark to lower angle of cell, then angled outwards to outer angle; a white marginal band and black marginal line; the cilia white, olive at base. Hind wing pure white, with fine black marginal line.

Hab. São Paulo; Castro Paraña, Brazil (*Jones*). *Exp.* 26 mm.

(29)†Platytes endochalybella, n. sp.

♂. Head and collar brown; thorax and abdomen golden bronze. Fore wing dark vinous brown; the inner area golden bronze, with two small brown and white lunules at middle; a pale white-edged somewhat triangular mark beyond lower angle of cell; a white marginal band with dentate inner edge not reaching inner margin. Hind wing pale; the apical area tinged with fuscous; traces of a waved fuscous submarginal line.

Hab. Castro Paraña, Brazil (*Jones*). *Exp.* 26 mm.

(30)†Platytes pentadactylus, Zell. Mon. Chil. & Cramb. p. 38. New Zealand; Tasmania.

†*Aquita claviferella*, Wlk. xxxv. 1765.

†*Aphomia strigosa*, Butl. P. Z. S. 1887, p. 398, pl. 43. f. 10.

(31)†Platytes ictericalis, Swinh. P. Z. S. 1885, p. 876, pl. 57. f. 16. Poona.

(32)†Platytes fuscivenalis, n. sp.

Ochreous. Fore wings with the veins streaked with brown; an obsolescent, bisinuate, very oblique leaden-coloured antemedial line; two leaden-coloured discocellular specks; a postmedial leaden-coloured line, very oblique, from costa to vein 6, then waved and obsolescent; a marginal series of dark specks. Hind wing pale ochreous, with dark marginal specks from apex to vein 3.

Hab. Ceylon (*Pole*). *Exp.* 18 mm.

(33)†Platytes plumbeolinealis, n. sp.

Differs from *fuscivenalis* in being uniform ochreous irrorated with fuscous. Fore wing with the ante- and postmedial lines prominently silvery, oblique from costa to above middle, then waved and nearly erect to inner margin. Hind wing with traces of submarginal line.

Some specimens have the fore wing strongly suffused with leaden grey before the antemedial and beyond the postmedial lines.

Hab. Punjab; Ceylon (*Pole*). *Exp.* 18 mm.

Type. (34) Platytes cerusella, Schiff. Europe.

b. Fore wing with the outer margin slightly indented at vein 6.

(35)†Platytes argentisparsalis, n. sp.

♀. Differs from *plumbeolinealis* in being more fuscous and prominently irrorated with black scales. Fore wing with brilliant silver line from base of costa to median nervure, near angle of cell, then erect to inner margin, with a black spot inside it below the cell; a curved silver fascia on subcostal nervure at end of cell, and a spot at lower angle; the silvery submarginal line more excurved below costa and nearer the margin; the marginal specks more prominent and on a grey band.

Hab. Ceylon (*Pole*). *Exp.* 18 mm.

(36)†Platytes kadenii, Zell. Mon. Chil. & Cramb. p. 16. Venezuela.

B. Fore wing with the apex produced to a long point.

(37)†Platytes caractella, Zell. Europe.

(38) Platytes alpinella, Hübn. Europe.

List of undetermined Species.

Catharyla interrupta, Zell. Stett. ent. Zeit. 1866, p. 156, pl. i. f. 15. Venezuela.
„ *contiguella*, Zell. Verh. z.-b. Wien, xxxii. p. 540. Texas.
„ *rufisignella*, Zell. Verh. z.-b. Wien, xxii. p. 540. Texas.
Argyria subtilis, Feld. Reis. Nov. pl. 137. f. 22. Bogotá.
„ *mesodonta*, Zell. Hor. Ent. Ross. xiii. p. 62. Chanchamayo.
„ *sordipes*, Zell. Hor. Ent. Ross. xiii. p. 67. Buenos Ayres.
„ *pentaspila*, Zell. Hor. Ent. Ross. xiii. p. 70. New Friburg.
„ *bifasciella*, Snell. Tijd. v. Ent. xxxvi. p. 63, pl. 3. f. 5. Celebes.
Tortrix norwichiana, Hübn. Eur. Schmett. Tort. f. 252. ? America.
Platytes lugdunella, Snell. Europe.

Genus Eromene.

Eromene, Hübn. Verz. p. 366 (?1818).
Euchromius, Guen. Ind. Meth. p. 86 (1845), preocc.

Proboscis well developed; palpi porrect, extending about twice the length of head, and thickly scaled; maxillary palpi triangularly scaled; frons produced to a conical process; antennæ of male thickened and flattened; tibiæ with the outer spurs about two thirds length of inner. Fore wing with the apex usually rounded; vein 3 from before angle of cell; 4, 5 well separated at origin; 7 well separated from 8, 9; 10 free; 11 oblique and not approximated to 12; male with a shallow fovea in cell. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Fig. 31.

Eromene ocellea, ♂. ¾.

(1)†Eromene expansa, Butl. Trans. Ent. Soc. 1881, p. 590. Japan.

Type. (2) Eromene bella, Hübn. Europe.

(3)†Eromene anapiella, Zell. Sicily.

(4)†Eromene wocheella, Zell. Europe.

(5) Eromene ramburiella, Dup. Sicily; Syria.
„ *vinculella*, Zell.

(6)†Eromene superbella, Zell. Europe; Syria; Punjab.

(7)*Eromene cambridgei, Zell. Trans. Ent. Soc. (3) v. p. 463. Egypt.

(8) Eromene ocellea, Haw. Europe; Algeria; Aden; Persia; Punjab; Bombay.

(9) Eromene californicalis, Pack. Ann. Lyc. N. York, x. p. 264. California; Sandwich Isls.

(10) Eromene texana, Rob. Ann. Lyc. Nat. Hist. ix. p. 155, pl. i. f. 5. U.S.A.

(11)*Eromene chiriquitensis, Zell. Hor. Ent. Ross. 1877, p. 70, pl. i. f. 25.

List of undetermined Species.

Eromene lata, Staud. Greece.
„ *jaxartella*, Ersch, Lep. Turk. p. 82. Turkestan.
„ *pulverosa*, Rom. Mém. iii. p. 47, pl. ii. f. 14. Transcaucasia.

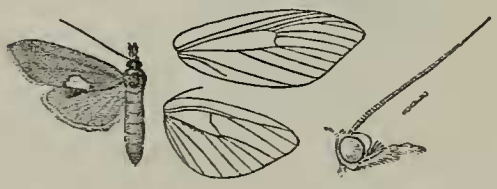
Genus Canuza.

Canuza, Wlk. xxxv. 1771 (1866).
Erotomanes, Meyr. P. Linn. Soc. N. S. W. vii. p. 152 (1882).

Proboscis well developed; palpi extending about twice the length of head and thickly clothed with long hair; maxillary palpi triangularly scaled; frons with a conical prominence; antennæ somewhat annulate; tibiæ with the spurs long; abdomen with the claspers large. Fore wing with the costa arched towards apex, which is somewhat rounded; vein 3 from before angle of cell; 4, 5 well separated at origin; 7 from upper angle; 10, 11 free and oblique. Hind wing with the median nervure slightly

pectinated; veins 1 *b* and *c* more strongly pectinate; vein 3 from before angle of cell; 4, 5 from a point; 6, 7 stalked.

Fig. 32.



Canuza euspilella, ♂. ¾.

Type. (1)†Canuza euspilella, Wlk. xxxv. 1771. Australia.

Anerastia mirabilella, Meyr. Proc. Linn. Soc. N. S. W. 1878, p. 213.

Genus Stenochilo, nov.

Palpi porrect, extending about one and a half times length of head, and smoothly scaled; maxillary palpi dilated with scales at extremity; proboscis absent; frons with a conical prominence; antennæ of female somewhat annulate; tibiæ with the outer spurs about two thirds length of inner. Fore wing long and very narrow; the apex rectangular; the inner margin lobed towards base; vein 3 from near angle of cell; 4, 5 well separated at origin; 6, 7 shortly stalked; 10, 11 free. Hind wing with vein 3 from near angle of cell; 4, 5 from a point; 6, 7 shortly stalked.

Fig. 33.

Stenochilo canicostalis, ♂. ½.

Type. †Stenochilo canicostalis, n. sp.

♀. Reddish brown, irrorated with grey; the head, collar, and costal area of fore wing very thickly irrorated; the last with white spot below middle of cell; traces of a submarginal line and marginal series of specks. Hind wing hyaline white.

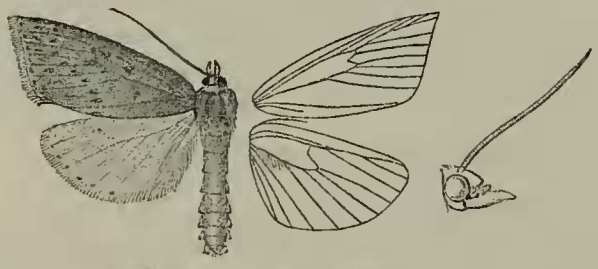
Hab. Hillaya, Sind. *Exp.* 30 mm.

Genus Macrochilo, nov.

Palpi porrect, clothed with rough hair, and extending about one and a half times length of head; maxillary palpi dilated with hair; frons with a conical process; antennæ of male thickened by appressed serrations; patagia fringed with long hair in male; tibiæ with the spurs long, the outer spurs about two thirds length

of inner. Fore wing with the apex acute and produced; vein 3 from before angle of cell; 4, 5 from angle; 7 shortly stalked, with 8, 9, 10; 11 oblique. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 stalked.

Fig. 34.



Macrochilo ambiguellus, ♂. ½.

Type. Macrochilo ambiguellus, Snell. Trans. Ent. Soc. 1890, p. 642, pl. xx. f. 4. Sikhim; Khásis.

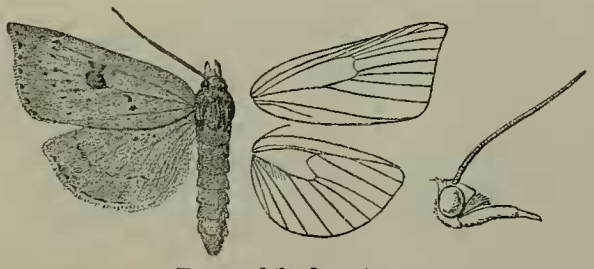
Pydna notata, Swinh. Trans. Ent. Soc. 1891, p. 479, pl. xix. f. 16.

Genus Erupa.

Erupa, Wlk. xxx. 980 (1864).
Gabalœca, Wlk. xxxv. 1743 (1866).
Zolca, Wlk. xxxv. 1769.

Palpi porrect, extending about three times length of head, and thickly clothed with hair; maxillary palpi triangularly dilated with hair; proboscis absent; frons with a conical projection; antennæ of male thickened and flattened, with appressed serrations. Fore wing with the costa arched at base; the apex somewhat produced; vein 3 from before angle of cell; 4, 5 well separated at origin; 6 from below upper angle; 7 from angle; 8, 9, 10 stalked; 11 oblique. Hind wing with vein 3 from before angle of cell; 4, 5 well separated at origin; 6, 7 from upper angle.

Fig. 35.



Erupa chiloides, ♂. ½.

Sect. I. Both wings with the outer margin evenly curved.

(1)†Erupa congruella, Wlk. xxxv. 1769. Brazil.

Chilo virgatus, Feld. Reis. Nov. pl. 137. f. 3.

(2)†Erupa argentescens, n. sp.

♂. Head and thorax red-brown, suffused with purplish grey; abdomen ochreous white, reddish at base. Fore wing rufous, suffused with silvery purple, except the costal area, and irrorated with a few dark scales; a rufous spot in middle of cell; an oblique rufous line from lower angle of cell to inner margin, with diffused rufous beyond it; a minutely crenulate submarginal line slightly excurved from costa to vein 2. Hind wing whitish, with slightly curved brown submarginal line; the outer area slightly tinged with brown.

Hab. Castro Paraña, Brazil (*Jones*). *Exp.* 38 mm.

(3)†Erupa nigrescentella, n. sp.

Dark fuscous brown; palpi white below at base; abdomen pale brown, the base tinged with fulvous. Wings glossy; fore wing with indistinct discocellular spot; both wings with traces of curved postmedial line.

Hab. Castro Paraña, Brazil (*Jones*). *Exp.* 28–30 mm.

Type. (4)†Erupa chiloides, Wlk. xxx. 980. Brazil.

(5)†Erupa bilineatella, Wlk. xxxv. 1743. Brazil.

(6)†Erupa lactealis, n. sp.

♀. Creamy white; palpi pale rufous at sides. Fore wing with the costal area tinged with rufous; a very oblique sinuous brown line from lower angle of cell to inner margin before middle; an oblique dentate brown submarginal line; the outer area and cilia tinged with rufous; some dark specks on the margin. Hind wing with short oblique brown line from lower angle of cell to below vein 2; a dentate brown submarginal line not reaching the costa or inner margin; some marginal dark specks and the cilia rufous towards apex.

Hab. Rio Janeiro. *Exp.* 36 mm.

(7)†Erupa pinosa[1], Zell. Hor. Ent. Ross. 1881, p. 165, pl. xi. f. 6. Colombia.

(8)†Erupa roseiceps, n. sp.

Head and collar bright pink; thorax, abdomen, and fore wing ochreous, the last irrorated with pinkish brown; traces of a pink fascia below the cell, and of a curved series of spots from its termination to costa; a dark discocellular speck; traces of a curved submarginal series of pinkish-brown spots; a marginal series of black specks. Hind wing yellowish white.

Hab. Castro Paraña, Brazil (*Jones*). *Exp.* 32 mm.

Sect. II. Both wings with the outer margin excurved between veins 4 and 2.

(9)†Erupa ruptilineella, n. sp.

Head and thorax dark rufous; abdomen ochreous. Fore wing

[1] Zeller's females are all males of his *Chilo validus*.

dark rufous with a silvery gloss; a short rufous line with white inner edge from costa to subcostal nervures before middle of similar slightly oblique line from middle of cell to inner margin; a rufous discocellular line; a white mark at lower angle of cell; a white-edged, rufous, slightly sinuous, oblique postmedial line. Hind wing ochreous; a discocellular fuscous spot; an oblique fuscous postmedial line, the area beyond it slightly tinged with fuscous.

Hab. Jalapa, Mexico (*Schaus*). *Exp.* 40 mm.

Undetermined Species.

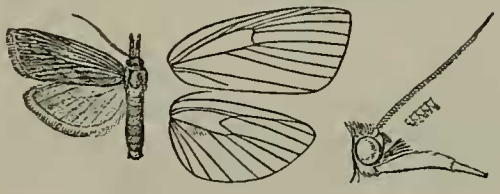
Erupa titanialis, Feld. Reis. Nov. pl. 137. f. 4. Brazil.

Genus Diatræa.

Diatræa, Lands. Guild. Trans. Soc. Encour. Arts, xlvi. 143 (1832).

Palpi extending about three times length of head and thickly clothed with hair; maxillary palpi triangularly dilated with hair; proboscis absent; frons with a tuft of hair; antennæ of male minutely serrate and fasciculate; tibiæ somewhat hairy, the spurs well developed. Fore wing with the apex somewhat acute; vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from near upper angle; 8, 9 stalked; 10 free; 11 anastomosing with 12. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Fig. 36.



Diatræa saccharalis, ♂. ½.

Type. (1) Diatræa saccharalis, Fabr. Ent. Syst. iii. 2, 238. S. States;
†*Chilo obliteratellus*, Zell. Mon. Chil. & Cramb. p. 8. W. Indies; Centr. &
†*Crambus leucaniellus*, Wlk. xxvii. 161. S. America.
† ,, *lineosellus*, Wlk. xxvii. 162.
Chilo companellus, Feld. Reis. Nov. pl. 137. f. 5.
† ,, *crambidoides*, Grote, Can. Ent. xii. p. 15.

(2)†Diatræa lineolata, Wlk. ix. p. 100. Centr. & S. America.
†*Chilo culmicolellus*, Zell. Mon. Chil. & Cramb. p. 7.
† ,, *neuricellus*, Zell. Mon. Chil. & Cramb. p. 8.
†*Crambus impersonatellus*, Wlk. xxvii. 163.

(3)†Diatræa mauriciella, Wlk. xxvii. 141. Mauritius.

(4)†Diatræa venosata, Wlk. xxvii. 144. Borneo; Java.
„ *striatalis*, Snell. Tijd. Ent. xxxiv. p. 349, pl. xix. ff. 1–4.

(5)†Diatræa canella, Hmpsn. A. M. N. H. (6) xvi. p. 349. W. Indies; Brazil.

Undetermined Species.

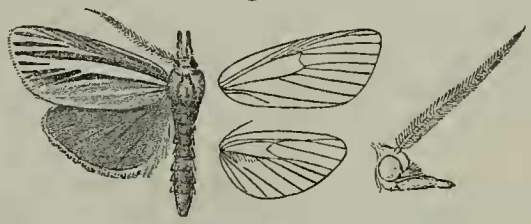
Diatræa differentialis, Fern. Ent. Am. iv. p. 120. U.S.A.

Genus Ubida.

Ubida, Wlk. xxvii. 185 (1863).
Crunophila, Meyr. P. Linn. Soc. N. S. W. vii. p. 152 (1882).

Proboscis absent; palpi porrect, extending about twice the length of head and thickly clothed with hair; maxillary palpi triangularly scaled; frons rounded; antennæ of male bipectinate with short branches, of female serrate; tibiæ with the spurs long. Fore wing with the apex rounded; vein 3 from before angle of cell; 4, 5 well separated at origin; 7 from upper angle; 10, 11 free and oblique. Hind wing with vein 3 from before angle of cell; 4, 5 from a point; 6, 7 from upper angle.

Fig. 37.



Ubida ramostriella, ♂. ½.

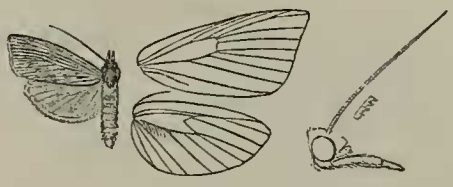
Type. †Ubida ramostriella, Wlk. xxvii. 172. Australia.
† „ *receptalis*, Wlk. xxvii. 186.
Chilo schistellus, Meyr. P. L. Soc. N. S. W. iv. p. 207.

Genus Chilo.

Chilo, Zinck. Germ. Mag. ii. 36 (1817).
Erpina, Wlk. xxxv. 1707 (1866).
Donacoscaptes, Zell. Hor. Ent. Ross. 1877, p. 16.
Diphrix, Grote, Bull. U.S. Geol. Surv. vi. p. 273 (1881).

Palpi porrect, clothed with rough hair, and extending from two and a half to three times length of head; maxillary palpi dilated with scales at extremity; frons with a conical projection; antennæ minutely serrate and ciliated; tibiæ with the outer spurs about two thirds length of inner. Fore wing with the apex slightly produced in male, more produced in female; vein 3 from before angle of cell; 4, 5 well separated at origin; 7 straight and well separated from 8, 9; 10 free; 11 curved and approximated to 12. Hind wing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Fig. 38.



Chilo simplex, ♂. ½.

Sect. I. Hind wing of male with no fold below subcostal nervure containing a tuft of hair.

A. Fore wing of female with the apex slightly produced.

a. (*Donacoscaptes*). Frons produced to a long sharp point.

(1) Chilo validus, Zell. Hor. Ent. Ross. 1877, p. 16, pl. i. f. 4 *a*, *b*. Colombia; Amazons.

b. Frons with a much shorter conical prominence.

(2) Chilo dichromellus, Wlk. xxxv. 1707. *Hab.* unknown.

(3)†Chilo vinosellus, n. sp.

♂. Dark red-brown with a purplish tinge. Fore wing with purplish suffusion in cell and on outer area; a whitish mark at lower angle of cell; a series of whitish submarginal specks; a marginal series of black specks and white specks at base of cilia. Hind wing paler except the outer area.

Hab. British Honduras. *Exp.* 30 mm.

(4)†Chilo incanellus, n. sp.

♂. Grey-brown; vertex of head whitish; palpi and frontal tuft blackish at sides; shoulders blackish; abdomen blackish, with pale rings and dark anal tuft. Fore wing irrorated with a few black scales and with faint traces of oblique postmedial and submarginal lines. Hind wing fuscous; the inner area clothed with blackish hair; both wings with marginal series of black specks. Underside whitish; both wings with indistinct curved submarginal line.

Hab. Castro Paraña, Brazil (*Jones*). *Exp.* 46 mm.

(5)†Chilo nigristigmellus, n. sp.

♀. Pale ochreous; the base of abdomen fulvous; fore wing thickly irrorated with black; a prominent black discocellular spot; an oblique line from beyond upper angle of cell to inner margin before middle; traces of a submarginal line. Hind wing whitish, with blackish hair on inner area; a diffused postmedial line; both wings with the marginal specks prominent; underside with black discocellular spot.

Hab. Castro Paraña, Brazil (*Jones*). *Exp.* ♂ 44, ♀ 60 mm.

(6)†Chilo fuscidentalis, n. sp.

♀. Reddish brown suffused with fuscous. Fore wing with the costal half fuscous to beyond cell; a reddish-brown spot in end of cell; a dentate dark antemedial line oblique from costa to vein 1; a curved highly dentate dark submarginal line. Hind wing with obscure curved diffused postmedial line terminating at vein 2.

Hab. Sikhim, Bengal (*Dudgeon*). *Exp.* 46 mm.

(7)†Chilo xylinalis, n. sp.

♂. Very dark cupreous brown. Fore wing with a black streak irrorated with grey scales in and below end of cell and a similar streak below median nervure. Hind wing dark red-brown.

♀. Pale yellowish brown; abdomen tinged with fuscous, the 3rd segment with a yellowish band. Fore wing slightly irrorated with black scales, forming an obscure streak below median nervure; a few dark scales in end of cell; a spot on discocellulars and another beyond them; two obscure series of submarginal specks; a marginal series of black specks. Hind wing whitish, suffused with pale fuscous brown. Underside whitish.

Hab. Goya, Argentina (*Perrins*). *Exp.* ♂ 30, ♀ 40–50 mm.

(8)†Chilo ignitalis, n. sp.

♂. Head and thorax red-brown; abdomen pale. Fore wing red-brown, pale in parts, in others suffused with purple; an indistinct dark subbasal spot below median nervure; an obscure dark antemedial line angled below median nervure; an oblique somewhat maculate medial line and a similar postmedial line angled on vein 5. Hind wing pale yellowish; the apical part of margin tinged with fuscous.

♀ with the head, thorax, and fore wing fiery chestnut.

Hab. São Paulo, Brazil. *Exp.* ♂ 32, ♀ 40 mm.

(9)†Chilo infusellus, Wlk. xxvii. 140. Surinam; Santarem; Amazons.

(10)†Chilo purpurealis, n. sp.

♂. Yellowish brown suffused with purple; abdomen pale. Fore wing with the inner area in some specimens mostly ochreous; somewhat ill-defined oblique antemedial and medial minutely dentate dark lines from cell to inner margin; a black discocellular spot; a minutely dentate dark submarginal line curved below costa. Hind wing pale yellowish with slight fuscous tinge.

♀. Fiery orange-red; abdomen and hind wing yellowish white; fore wing with the lines indistinct; the cilia dark.

Hab. Goya, Argentina (*Perrins*). *Exp.* ♂ 30, ♀ 42 mm.

(11)†Chilo demotellus, Wlk. xxxv. 1749. Japan.

(12) Chilo lutellus, Motsch. Bull. Mosc. xxxix. i. 198. Egypt;
,, *dubia*, Baker, Trans. Ent. Soc. 1894, p. 48, pl. i. f. 18. Japan.

(13)†Chilo obliquilineellus, n. sp.

Dull ochreous; abdomen with a fulvous basal band. Fore wing slightly suffused and irrorated with pale reddish brown; an indistinct brown hue from outer margin at vein 5 running to near origin of vein 2 and minutely dentate on the veins, then strongly dentate below vein 2 and terminating at middle of inner margin; a discocellular spot; traces of a waved submarginal line excurved to near margin at middle; a marginal series of black specks. Hind wing yellowish white.

One specimen has the thorax and base of fore wing much brighter yellow, the area beyond the irregular line almost white.

Hab. Rio Janeiro (*Schaus*). *Exp.* ♂ 44–48, ♀ 54 mm.

(14)†Chilo luniferalis, n. sp.

♀. Ochreous white. Fore wing with traces of a streak of black scales below cell; a black discocellular lunule with a diffused streak of black scales from it to outer margin; a prominent series of marginal black spots. Hind wing pure white, with a few fuscous specks on the margin.

Hab. Abyssinia. *Exp.* 34 mm.

(15)†Chilo simplex, Butl. P. Z. S. 1880, p. 690. Japan; China; Formosa; Punjab; Sind.

†*Crambus zonellus*, Swinh. P. Z. S. 1884, p. 528 pl. 48. f. 16.

† „ *partellus*, Swinh. P. Z. S. 1885, p. 879.

(16)* Chilo gensanellus, Leech, Entom. xxii. p. 108, pl. v. f. 9. Corea; Japan.

(17)†Chilo plejadellus, Zinck. Germ. Mag. iv. p. 251.

†*Crambus sabuliferus*, Wlk. xxvii. 185. U.S.A.

†*Diphrix prolatella*, Grote, U.S. Geol. Surv. vi. p. 273.

Chilo orizœellus, Riley, Rep. Ins. 1882, p. 135, pl. vii. f. 1.

(18)†Chilo ceylonica, n. sp.

Ochreous brown irrorated with fuscous. Fore wing with the fuscous irroration forming streaks in the interspaces except on inner margin; an indistinct fulvous medial line curved below costa and with silvery streaks on its edges; a submarginal silver line bent inwards below costa; a marginal series of black spots with white centres; cilia silvery. Hind wing whitish, tinged with fuscous on apical area in male; an indistinct marginal series of black specks.

Hab. Ceylon (*Pole*). *Exp.* ♂ 22, ♀ 26 mm.

(19)†Chilo suppresalis, Wlk. xxvii. 166. S. Africa; China; India; Ceylon.

(20)†Chilo pulverulentus, Warr. A. M. N. H. (6) ix. p. 393. Punjab; Khásis.

(21) Chilo alleni, Fern. Ent. Am. iv. p. 120. U.S.A.

(22)*Chilo torrentellus, Meyr. Proc. Linn. Soc. N. S. W. iii. p. 183. Sikhim; Burma; Australia.

(23) Chilo scissellus, McVind. Brazil; Argentina.

(24) Chilo cicatrellus, Hübn. Europe.

(25) Chilo respersalis, Hübn. Exot. Schmett. ff. 125, 126. Argentina; Chili.

† „ *ceres*, Butl. Trans. Ent. Soc. 1883, p. 61.

B. Fore wing of female with the apex extremely produced and acute.

Type. (26) Chilo phragmitellus, Hübn. Europe.

Sect. II. Hind wing of male with a fold below the subcostal nervure containing a tuft of long hair.

(27)†Chilo lativittalis, Wlk. xxvii. 171.

† „ *halterellus*, Zell. Mon. Chil. & Cramb. p. 33. Australia.

List of undetermined Species.

Chilo cinnamomellus, Berg, Bull. Mosc. xlix. pt. 2, p. 227. Patagonia.

„ *prodigealis*, Zell. Hor. Ent. Ross. xiii. 18, pl. i. f. 5. New Friburg.

„ *heracleus*, Zell. Hor. Ent. Ross. xiii. 20, pl. i. f. 6. Brazil.

„ *paramattellus*, Meyr. J. L. Soc. N. S. W. iii. p. 178. Australia.

„ *spatiosellus*, Möschl. Verh. z.-b. Ges. Wien, xxxi. p. 436. Surinam.

„ *surinamellus*, Möschl. Verh. z.-b. Ges. Wien, xxxi. p. 436. Surinam.

„ *irrectellus*, Möschl. Verh. z.-b. Ges. Wien, xxxi. p. 437, pl. xviii. ff. 41–44. Surinam.

„ *centrellus*, Möschl. Verh. z.-b. Ges. Wien, xxxii. 360, pl. xviii. f. 45. Surinam.

„ *infuscatellus*, Snell. Tijds. Ent. xxxiv. 347. Java.

Genus Chalcoëla.

Chalcoëla, Zell. Verh. zool.-bot. Ges. Wien, 1872, p. 528.

Proboscis absent; palpi porrect, extending about twice the length of head, the 1st joint fringed with long hair below, the 2nd and 3rd nearly naked; maxillary palpi dilated with scales at extremity; frons rounded; antennæ thickened and flattened; tibiæ with the spurs long. Fore wing broad; the apex rounded; vein 3 from near angle of cell; 4, 5 from angle; 7 from upper angle; 10, 11 free. Hind wing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Fig. 39.

Chalcoëla iphitalis, ♂. ⅔.

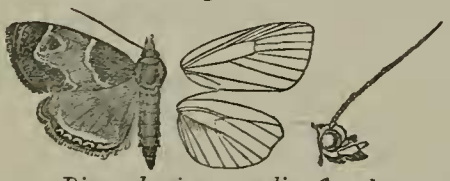
Type. CHALCOËLA IPHITALIS, Wlk. xvii. 444 [1]. U.S.A.
† „ *aurifera*, Zell. Verh. zool.-bot. Ges. Wien, 1872, p. 529, pl. 2. f. 2.

Genus DICYMOLOMIA.

Dicymolomia, Zell. Verh. zool.-bot. Ges. Wien, 1872, p. 530.

Differs from *Chalcoëla* in the palpi extending about the length of head and with tufts of long hair from below both 1st and 2nd joints.

Fig. 40.



Dicymolomia pegasalis, ♂. ½.

Type. (1)†DICYMOLOMIA JULIANALIS, Wlk. xvii. 438. U.S.A.
† „ *decora*, Zell. Verh. zool.-bot. Ges. Wien, 1872, p. 531, pl. 2. f. 13.

(2) DICYMOLOMIA METALLIFERALIS, Pack. Ann. Lyc. N. Y. x. p. 265. California.
. †*Dicymolomia sauberi*, Von Hedemann, Verh. Ver. Hamb. v. Anhang.

(3)†DICYMOLOMIA PEGASALIS, Wlk. xvii. 438. U.S.A.; Jamaica.
†*Cataclysta principalis*, Wlk. xxxiv. 1333.
† „ *egressalis*, Wlk. xxxiv. 1335.
„ *robinsonii*, Grote, Can. Ent. iii. p. 181.

(4)†DICYMOLOMIA DIMINUTALIS, Warr. A. M. N. H. 1891, ii. p. 65. Callao.

Genus LEUCARGYRA, nov.

Palpi porrect and not reaching nearly to the end of the frons, which is greatly produced to a corneous point; maxillary palpi minute; proboscis rudimentary; antennæ of male minutely serrate; tibiæ with the spurs short. Fore wing with vein 3 from before angle of cell; 4, 5 from angle; 6 from upper angle; 7, 8, 9, 10

[1] The locality of Walker's type is given as S. Africa, but the specimen was purchased from a dealer and the locality is almost certainly wrong.

stalked; 11 becoming coincident with 12. Hind wing with vein 3 from before angle of cell; 4, 5 well separated at origin; 6, 7 stalked.

Fig. 41.

Leucargyra puralis, ♂. ½.

Type. †Leucargyra puralis, n. sp.

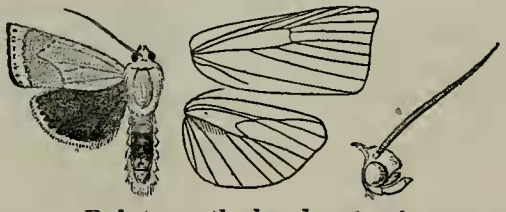
♂. Silvery white; palpi black at sides; fore legs black above. The larva feeds in the interior of grasses.
Hab. Theresopolis, Brazil. *Exp*. 60 mm.

Genus Eschata.

Eschata, Wlk. ix. p. 133 (1856).
Chærecla, Wlk. xxxii. p. 633 (1865).

Proboscis rudimentary. Palpi porrect, reaching slightly beyond the frons and thickly scaled; maxillary palpi dilated with scales and nearly as long as the labial; frons produced to an acute corneous point; antennæ of male thickened and flattened; tibiæ and tarsal joints fringed with long hair. Fore wing with vein 3 from before angle of cell; 7 from cell, anastomosing, or rarely shortly stalked with 8, 9; 10 free; 11 curved and running along 12. Hind wing with veins 3, 4, 5 from angle of cell; 6, 7 from upper angle.

Fig. 42.



Eschata xanthorhyncha, ♂. ½.

Sect. I. Fore wing with the apex somewhat acute and produced.

(1)†Eschata xanthorhyncha, n. sp.

♂. Differs from *gelida* in the head and thorax being white; palpi orange banded with white; fore legs orange fringed with white; tarsi banded with orange. Fore wing with the area between the postmedial and submarginal lines evenly irrorated with black scales.

Hind wing fuscous black; the cilia white. Underside with the basal two thirds of wings suffused with fuscous black.

Hab. Ceylon (*Butt*). *Exp.* 32 mm.

Type. (2)†Eschata gelida, Wlk. ix. p. 133. Sikhim; Khásis.

(3)†Eschata chrysargyria, Wlk. xxxii. 634. N. China; Sikhim; Assam; Nilgiris;

„ *argentata*, Moore, Lep. Atk. p. 227. Burma; Ceram.

(4)†Eschata xanthocera, n. sp.

♂. Differs from *chrysargyria* in the antennæ being orange; the legs orange fringed with white hair. Fore wing with the post-medial and submarginal lines almost obsolete; the cilia white with golden tips throughout.

Hab. Ceylon (*Green*). *Exp.* 38 mm.

Sect. II. Fore wing with the apex rectangular and not produced.

(5)†Eschata conspurcata, Moore, Lep. Atk. p. 227. Sikhim.

(6)†Eschata percandida, Swinh. Trans. Ent. Soc. 1890, p. 293. Rangoon.

(7)†Eschata ochripes, Hmpsn. Ill. Het. viii. p. 143, pl. 156. f. 23. Nilgiris.

Genus Doratoperas, nov.

Proboscis absent; palpi clothed with hair and hardly extending beyond the maxillary palpi and the long pointed frontal process; antennæ of male serrate and fasciculate, of female minutely serrate and ciliated; tibæ with the spurs short. Fore wing long and narrow; the apex produced and acute in female; vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from a point; 8, 9 from well before upper angle; 10, 11 free. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle.

Fig. 43.

Doratoperas atrosparsellus, ♂. ½.

Type. †Doratoperas atrosparsellus, Wlk. xxvii. 163. Columbia; Brazil.

†*Nystalia zeuzeroides*, Wlk. xxxiii. 761.

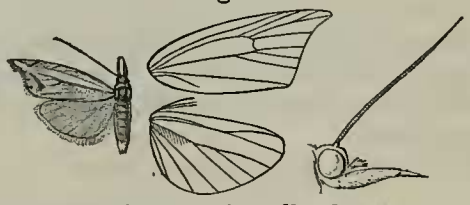
†*Donacoscaptes lanceolatus*, Zell. Hor. Ent. Ross. 1881, p. 159, pl. xi. f. 4.

Chilo spectabilis, Feld. Reis. Nov. pl. 137. f. 2.

Genus Raphiptera, nov.

Palpi extending about three times length of head and thickly clothed with hair; maxillary palpi triangularly scaled; proboscis well developed; frons flat; antennæ of female nearly simple. Fore wing with the apex extremely produced and acute; vein 4 absent; 7 absent; 8, 9 stalked; 11 absent. Hind wing with veins 4 and 6 absent; the cell completely open.

Fig. 44.



Raphiptera minimella, ♀. ½.

Type. Raphiptera minimella, Rob. Ann. N. Y. Lyc. ii. 315. U.S.A.

Genus Mesolia.

Mesolia, Rag. Ann. Soc. Ent. Fr. 1888, p. 282.

Palpi porrect, thickly clothed with hair and extending about twice the length of head; maxillary palpi triangularly scaled; frons with a conical projection; tibiæ with the outer spurs about half the length of inner. Fore wing long and narrow, the apex rounded; the outer margin produced from apex to vein 5; vein 7 when present stalked with 8, 9; 10, 11 when present free. Hind wing with vein 4 usually absent; 6 from upper angle; the upper margin of cell widely separated from 8, 7 curving upwards to anastomose with 8.

Fig. 45.

Mesolia pandavella, ♂. ½.

Sect. I. Fore wing with veins 7 and 11 present.

A. Both wings with vein 4 absent.

a. Antennæ of male thickened and flattened.

Type. (1) Mesolia pandavella, Rag. Ann. Soc. Ent. Fr. 1888, p. 282. N.W. Himalayas; Punjab; S. India; Ceylon.

b. Antennæ of male serrate.

(2)†Mesolia pluri mella, Wlk. xxvii. 162. Jamaica; San Domingo.

B. Fore wing with veins 4, 5 stalked; hind wing with veins 4, 5 stalked, or 4 absent; antennæ of male thickened and flattened.

(3) Mesolia incertella, Zinck. Germ. Mag. iv. 253. U.S.A.
†*Prionopteryx olivella*, Grote, Bull. U.S. Geol. Surv. vi. 274.

c. Both wings with veins 4, 5 from cell.

(4)†Mesolia whiteheadi, E. Wollaston, A. M. N. H. (5) iii. p. 340. St. Helena.

(5)†Mesolia tenebrella, n. sp.

♀. Fuscous brown irrorated with grey. Fore wing with a black discocellular spot; two indistinct pale lines across apex, with some chestnut between them, the inner continued as an obscure dentate submarginal line with a grey patch beyond it at middle on which are two black streaks. Hind wing paler fuscous.
Hab. Ichang, China. *Exp.* 20 mm.

Sect. II. Fore wing with veins 4, 7 and 11 absent; hind wing with vein 4 absent; antennæ of male ciliated.

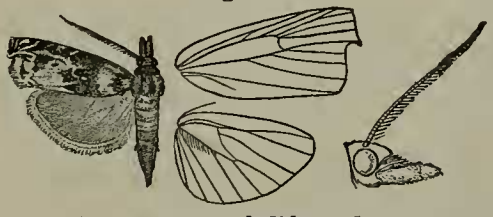
(6) Mesolia apicistrigella, Meyr. P. L. Soc. N.S.W. 1879, p. 209. Australia.

Genus Prionopteryx.

Prionopteryx, Steph. Ill. Brit. Ent., Haust. iv. p. 317 (1834).
Nuarace, Wlk. xxvii. 188 (1863).

Palpi thickly clothed with hair and extending about twice the length of head; maxillary palpi triangularly scaled; proboscis well developed; frons with a conical prominence; antennæ of male bipectinated; tibiæ with the spurs long. Fore wing with the outer margin produced from apex to vein 5; vein 3 from before angle of cell; 4, 5 separated at origin; 7 when present from cell; 10 free. Hind wing with vein 3 from before angle of cell; 6 from below upper angle.

Fig. 46.



Prionopteryx nebulifera, ♂. ½.

Sect. I. Fore wing with vein 7 present.

A. Fore wing with vein 11 becoming coincident with 12; hind wing with vein 4 absent.

a. Fore wing with the projection of outer margin blunt.

(1)†Prionopteryx eugraphis, Wlk. xxvii. 188. San Domingo.

b. Fore wing, the projection of outer margin acute and hooked; antennæ of male with short branches.

(2)*Prionopteryx elongata, Zell. Hor. Ent. Ross. 1877, p. 27, pl. i. f. 9. C. America.

Type. (3)†Prionopteryx nebulifera, Steph. Ill. Brit. Ent., Haust. iv. p. 317. Florida.
Diathrausta octomaculalis, Fern. Ent. Am. iii. p. 127.

B. Fore wing with vein 11 free; the projection of outer margin blunt; hind wing with vein 4 stalked with 5; antennæ of male with long branches.

(4)†Prionopteryx africalis, n. sp.

♂. Reddish brown suffused with grey; palpi fuscous at sides; antennæ ringed black and white. Fore wing with diffused grey below median nervure; an antemedial patch of dark scales above inner margin; the postmedial line very indistinct, highly angled on vein 5, then inwardly oblique and with streaks of dark scales beyond it; a submarginal brown line with white inner edge angled outwards to the marginal projection, then with three black specks with triangular white marks between them beyond it. Hind wing paler grey-brown; the cilia whitish.

♀. Rather paler and without the dark marks beyond the postmedial line of fore wing.

Hab. Accra, W. Africa; Congo. *Exp.* ♂ 16, ♀ 24 mm.

Sect. II. Fore wing with vein 7 absent; 11 becoming coincident with 12; hind wing with vein 4 absent; antennæ of male with the branches of moderate length.

A. Antennæ of female simple; fore wing with the projection of outer margin acute and hooked.

(5)†Prionopteryx achatina, Zell. Mon. Chil. & Cramb. p. 13. U.S.A.

B. Antennæ of female serrate; fore wing with the projection of outer margin rounded.

(6)†Prionopteryx griseosparsa, n. sp.

♀. Head, thorax, and abdomen fuscous brown, thickly irrorated with grey. Fore wing brown, thickly irrorated with white; an obscure discocellular brown spot; a white mark at apex and some white on cilia. Hind wing whitish.

Hab. Colorado (*Cockerell*). *Exp.* 30 mm.

List of undetermined Species.

Prionopteryx texturella, Zell. Hor. Ent. Ross. xiii. 28, pl. i. f. 10. Zanzibar.

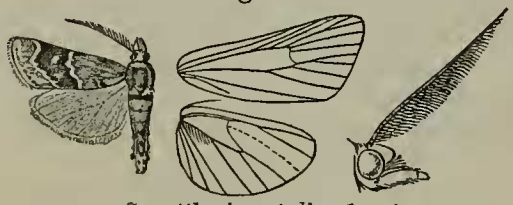
„ *bergii*, Zell. Hor. Ent. Ross. xiii. 30, pl. i. f. 11. Buenos Ayres.

Genus Surattha.

Surattha, Wlk. xxvii. 75 (1863).
Calarina, Wlk. xxxv. 1770 (1866).

Palpi porrect and thickly scaled, extending about one and a half times length of head; maxillary palpi triangularly scaled; frons with a conical process; antennæ of male bipectinated, usually with long branches; tibiæ with the spurs long, the outer spurs about two thirds length of inner. Fore wing long and narrow; the apex rounded; vein 3 from near angle of cell; 4, 5 usually on a long stalk; 6, 7 and 10, 11 free. Hind wing with vein 3 from near angle of cell; 5 absent; 6 obsolescent from above middle of discocellulars; 7 anastomosing with 8.

Fig. 47.



Surattha invectalis, ♂. ½.

Sect. I. Fore wing with veins 4, 5 stalked.

Type. (1)†Surattha invectalis, Wlk. xxvii. 76. India; Ceylon; Burma; Java.
†*Pindicitora thysbesalis*, Wlk. xxvii. 135.
†*Scopula nigrifascialis*, Wlk. xxxiv. 1472.
†*Calarina albirenella*, Wlk. xxxv. 1770.

(2)†Surattha neotropicalis, n. sp.

♀. Ochreous brown irrorated with fuscous; abdomen with the base tinged with fulvous. Fore wing thickly irrorated; a fuscous spot at base of median nervure; a medial dark line, slightly sinuous, acutely angled on vein 2, with pale inner edge, and a large fuscous triangular patch beyond it with its base on costa and apex at the angle of the line; a dark discocellular lunule; a minutely dentate submarginal white line, with fuscous on its inner edge and indistinct lunulate brown line beyond it; a marginal series of black specks. Hind wing white; the outer area tinged with fuscous from apex to vein 2.

Hab. Goya, Argentina. *Exp.* 30 mm.

(3)†Surattha albipennis, Butl. P. Z. S. 1886, p. 383. Punjab; Sind; E. Africa.

(4)†Surattha scitulella, Wlk. xxxv. 1755. S. India; Ceylon.

Sect. II. Fore wing with veins 4, 5 from cell.

A. Antennæ of male with long branches.

(5)*Surattha termia, Meyr. Trans. Ent. Soc. 1885, p. 452. Australia.

B. Antennæ of male bipectinated, with short branches dilated at extremity.

(6)†Suratta fuscilella, Swinh. A. M. N. H. (6) xvi. p. 301. W. India.

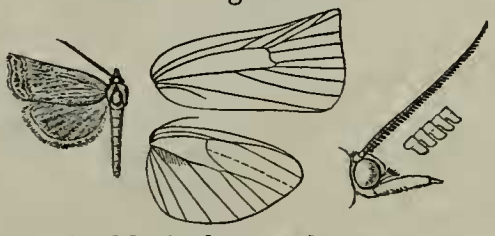
(7 Suratta penteucha, Meyr. Trans. Ent. Soc. 1885, p. 453. Australia.

Genus Ancylolomia.

Ancylolomia, Hübn. Verz. p. 363 (? 1818).
Jartheza, Wlk. xxvii. 183 (1863).

Palpi porrect, thickly clothed with hair, and extending about three times the length of head; maxillary palpi triangularly scaled; frons oblique; abdomen long; tibiæ with the outer spurs about two thirds length of inner. Fore wing long and narrow, the apex produced; the outer margin excised below apex, then excurved; veins 3, 4, 5 from angle of cell; 7, 8, 9 stalked; 10 free; 11 becoming coincident with 12. Hind wing with vein 3 from close to angle of cell; 4, 5 from angle or stalked; 6 from above middle of discocellulars and obsolescent; 7 anastomosing with 8.

Fig. 48.



Ancylolomia chrysographella, ♂. ½.

Sect. I. Antennæ of male with short uniseriate laminate branches, of female simple.

Type. (1) Ancylolomia tentaculella, Hübn. Europe.

(2) Ancylolomia contritella, H.-S. Europe.

(3) Ancylolomia chrysographella, Koll. Hüg. Kasch. iv. p. 494.

† „ *capensis*, Zell. Mon. Chil. & Cramb. p. 11. E. & S. Africa; Aden; Japan;

„ *westwoodi*, Zell. Mon. Cramb. p. 11. China; Formosa; throughout India,

† „ *taprobanensis*, Zell. Hor. Ent. Ross. 1877, p. 2, pl. i. f. 8. Ceylon, and Burma; Penang.

„ *sansibarica*, Zell. Hor. Ent. Ross. xiii. 23, pl. i. f. 7. Australia.

„ *indica*, Feld. Reis. Nov. pl. 137. f. 9.

† „ *argentata*, Moore, Lep. Ceyl. iii. p. 382, pl. 184. f. 3.

(4) Ancylolomia locupletella, Koll. Hüg. Kasch. iv. p. 394. N.W. Himalayas; Ceylon.

Sect. II. Antennæ of male with long uniseriate branches, of female simple.

(5)†Ancylolomia pectinatella, Zell. Europe.

(6) Ancylolomia palpella, Schiff. Europe.

(7)†Ancylolomia saundersiella, Zell. Mon. Chil. & Cramb. p. 10. W. India.
Jartheza biplagella, Moore, P. Z. S. 1872, p. 582, pl. 34. f. 9.
† „ *obstitella*, Swinh. P. Z. S. 1883, p. 880, pl. 57. f. 3.

(8)†Ancylolomia responsella, Wlk. xxvii. 184. Himalayas;
†*Jartheza xylinella*, Wlk. xxvii. 184. W. India.
† „ *cassimella*, Swinh. P. Z. S. 1886, p. 461, pl. 41. ff. 4, 6.

(9)†Ancylolomia basistriga, Moore, Lep. Ceyl. iii. p. 382, pl. 184. f. 1. Ceylon.

Sect. III. Antennæ of female serrate.

(10)†Ancylolomia uniformella, n. sp.

♀. Pale ochreous. Fore wing thickly irrorated with fuscous; the irroration rather thicker in the cell, where it forms an obscure fascia. Hind wing pure white.

Hab. Hydrabad, Sind (*Swinhoe*). *Exp.* 38 mm.

List of undetermined Species.

Ancylolomia hipponella, Rag. Ann. Soc. Ent. Fr. (6) viii. p. 279, pl. vi. ff. 11, 12. Algeria.
„ *inornatella*, Staud. Europe.

Genus Talis.

Talis, Guen. Ind. Micr. p. 86 (1845).
Hednota, Meyr. Trans. Ent. Soc. 1886, p. 270.
Araxates, Rag. Ann. Ent. Soc. Fr. (6) viii. p. 281.

Palpi extending about twice the length of head and thickly clothed with hair; maxillary palpi triangularly scaled; proboscis well developed; frons with a conical prominence; antennæ of male usually ciliated. Fore wing with vein 6 from below upper angle of cell; 7 from the angle; 8, 9 stalked; 10, 11 free. Hind wing with vein 3 from angle of cell; 6 from well below upper angle.

Fig. 49.

Talis bivitellus, ♂. ½.

Sect. I. (*Hednota*). Fore wing with vein 3 from before angle of cell; 5 from above angle; the apex acute.

A. Hind wing with veins 4, 5 from angle of cell.

a. Fore wing with the apex produced and acute.

(1) Talis milvellus, Meyr. J. L. Soc. N. S. W. iii. p. 181. Australia.

b. Fore wing with the apex rectangular.

(2)†Talis bifractellus, Wlk. xxvii. 174. New Guinea; Australia.

(3) Talis argyroëlis, Meyr. P. L. Soc. N. S. W. 1882, p. 163. Australia.

(4)†Talis subfumalis, n. sp.

♂. Chestnut-brown; palpi blackish; antennæ white on outer side; patagia silvery white. Fore wing with a fuscous-outlined silvery-white fascia from base, somewhat interrupted at middle of cell and double from cell to outer margin, where it joins the marginal series of silvery spots; a fuscous-edged silvery-white fascia below the cell more or less completely interrupted in four places. Hind wing fuscous.

Hab. Port Darwin, Australia. *Exp.* 18 mm.

(5) Talis aurantiacus, Meyr. P. L. Soc. N. S. W. 1878, p. 184. Australia.

(6)†Talis recurvellus, Wlk. xxvii. 171. W. Australia.

(7) Talis bivittellus, Don. Ins. New Holland. Australia.
†*Crambus trivittalis*, Zell. Mon. Chil. & Cramb. p. 34.

(8)†Talis impletellus, Wlk. xxvii. 175. Australia; Tasmania.

(9) Talis asterias, Meyr. Tr. Ent. Soc. 1887, p. 250. Swan River,
? †*Crambus demissalis*[1], Wlk. xxvii. 176. Australia.

(10)†Talis hydrophila, Butl. Trans. Ent. Soc. 1882, p. 36. Hawaii.

(11)†Talis floricolens, Butl. Trans. Ent. Soc. 1882, p. 36. Hawaii.

(12)*Talis pedionoma, Meyr. Tr. Ent. Soc. 1885, p. 453. Australia.

(13)*Talis leucophthalma, Meyr. N. Z. Journ. Sci. i. p. 186. New Zealand.

B. Hind wing with veins 4, 5 stalked.

a. Antennæ of male ciliated.

(14) Talis argentosus, Snell. Tijd. Ent. xxxvi. p. 657, pl. 3. f. 2. Centr. America; Bolivia; Argentina.

(15)†Talis pleniferellus, Wlk. xxvii. 173. Australia.
Crambus aurosus, Feld. Reis. Nov. pl. 137. f. 31.

(16)†Talis perlatalis, Wlk. xxvii. 174. Australia; Tasmania.

(17) Talis grammellus, Zell. Mon. Chil. & Cramb. p. 46. Australia; Tasmania.
Crambus enneagrammos, Meyr. P. L. Soc. N. S. W. 1878, p. 194.

[1] Walker's description does not agree with his supposed type.

(18) Talis acontophorus, Meyr. P. L. Soc. N. S. W. 1882, p. 167. Australia; Tasmauia.

(19) Talis longipalpellus, Meyr. P. L. Soc. N. S. W. 1878, p. 196. Australia.

b. Antennæ of male serrate.

(20)†Talis opulentus, Zell. Mon. Chil. & Cramb. p. 46. Australia.

(21)†Talis relatalis, Wlk. xxvii. 172.
†*Crambus argyroneurus*, Zell. Mon. Chil. & Cramb. p. 47. Australia; Tasmania.

(22) Talis panselenellus, Meyr. P. L. Soc. N. S. W. 1882, p. 167. Australia; Tasmania.

c. Antennæ of male bipectinated.

(23) Talis hoplitellus, Meyr. P. L. Soc. N. S. W. 1878, p. 188. Australia.

Sect. II. (*Talis*). Fore wing with veins 4, 5 stalked, the apex rounded.

A. Antennæ of male ciliated.

Type. (24) Talis quercellus, Schiff. Europe.

(25) Talis pulcherrimus, Staud. Europe.

B. Antennæ of male pectinated.

(26)*Talis afra, Baker, Trans. Ent. Soc. 1894, p. 49. Egypt.

List of undetermined Species.

Talis invalidellus, Meyr. J. L. Soc. N. S. W. iii. p. 193. Tasmania.
Thisanotia pedalarcha, Meyr. Trans. Ent. Soc. 1885, p. 454. Australia.
Hednota xylophœa, Meyr. P. L. Soc. N. S. W. (2) i. p. 1038. Australia.
„ *toxotes*, Meyr. Tr. Ent. Soc. 1887, p. 249. Australia.
„ *gelastis*, Meyr. Tr. Ent. Soc. 1887, p. 250. Tasmania.
„ *oxyptera*, Meyr. Trans. Ent. Soc. 1888, p. 243. Australia.
Thisanotia œnochrois, Meyr. Trans. Ent. Soc. 1889, p. 520. New Guinea.
Talis dilatatalis, Christ. Europe.
„ *arenella*, Rag. Europe.

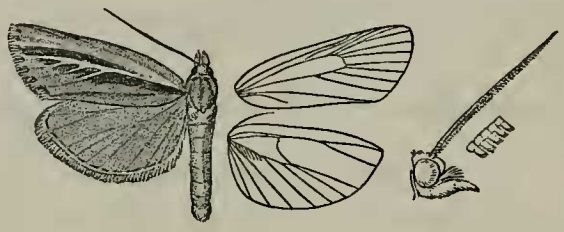
Genus Charltona.

Charltona, Swinh. P. Z. S. 1885, p. 879.

Palpi porrect, clothed with rough hair and projecting about one and a half times length of head; maxillary palpi triangularly

dilated with hair; frons rounded; tibiæ with the outer spurs about two thirds length of inner; wings long and narrow. Fore wing with the apex rectangular; vein 3 from before angle of cell; 4, 5 well separated at origin; 7 straight and well separated from 8, 9; 10 free; 11 curved and approximated to 12. Hind wing with vein 3 from near angle of cell; 4, 5 from angle and approximated for a short distance; 6 absent; 7 anastomosing with 8.

Fig. 50.



Charltona cervinella, ♂. ½.

Sect. I. Antennæ of male bipectinate, with short branches dilated at extremity.

Type. (1)†Charltona kala, Swinh. P. Z. S. 1885, p. 879, pl. 57. f. 4. W. & S. India.

Sect. II. Antennæ of male with short uniseriate laminated branches.

(2)†Charltona laminata, n. sp.

♂. Head, thorax, and fore wing uniform black-brown, the last with diffused long black scales with pale bases in interspaces of inner and outer areas; abdomen and hind wing fuscous brown.

Hab. Burma. *Exp.* 34 mm.

(3)†Charltona aurantifascia, n. sp.

Head and thorax fuscous grey, the vertex of head and patches on pro- and metathorax orange; abdomen orange. Fore wing dark silvery grey, with a broad orange fascia from base in and below cell and along vein 2 to beyond middle; a medial black line slightly excurved below costa, where there is an orange spot beyond it; a discocellular black lunule with an orange fascia from it to outer margin. Hind wing pale orange, with the apical area fuscous.

Hab. Accra; Gambia. *Exp.* ♂ 26, ♀ 40 mm.

(4)†Charltona bivitella, Moore, P. Z. S. 1872, p. 581, pl. 34. f. 8. Bombay.

(5)†Charltona cervinella, Moore, P. Z. S. 1872, p. 581, pl. 34. f. 7. W. & S. India.

†*Chilo interruptellus*, Moore, P. Z. S. 1872, p. 581, pl. 34. f. 5.

(6)†Charltona inconspicuella, Moore, P. Z. S. 1872, p. 582, pl. 34. f. 6. Bombay.

(7)†Charltona desistalis, Wlk. xxvii. 165; Moore, Lep. Ceyl. iii. pl. 184. f. 10. Ceylon.

(8)†Charltona consociella, Wlk. xxvii. 159. Bengal.

(9)†Charltona discella, Wlk. xxvii. 141. S. Africa; Madagascar.

Sect. III. Antennæ of male with long uniseriate branches.

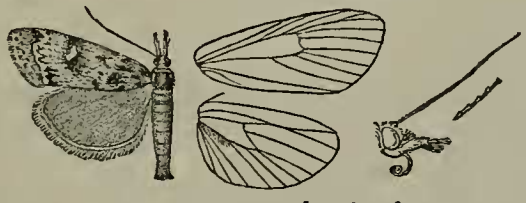
(10)†Charltona ortella, Swinh. P. Z. S. 1886, p. 461, pl. 41. f. 3. India.

Genus Scenoploca.

Scenoploca, Meyr. Trans. N. Z. Inst. 1882, p. 9.

Palpi with a projecting tuft of hair below 2nd joint, the 3rd naked; maxillary palpi triangularly scaled; proboscis present; antennæ somewhat annulated and ciliated. Fore wing with veins 3, 4, 5 from near angle of cell; 7 from upper angle; 8, 9 stalked; 10, 11 free. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6 from well below upper angle. Female with the wings aborted and incapable of flight.

Fig. 51.



Scenoploca petraula, ♂. ½.

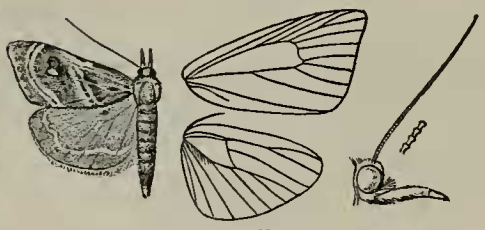
Type. *Scenoploca petraula, Meyr. Trans. N. Z. Inst. 1882, p. 9. New Zealand.

Genus Gadira.

Gadira, Wlk. xxxv. 1742 (1866).
Cryptomima, Meyr. Trans. N. Z. Inst. 1882, p. 8.

Palpi projecting about twice the length of head, and thickly clothed with hair; maxillary palpi triangularly scaled; proboscis well developed; frons flat; antennæ somewhat annulate; tibiæ with the spurs long. Fore wing with the apex produced and acute; a tuft of raised scales at lower angle of cell; veins 3, 4, 5 from near angle; 6 from well below upper angle; 7 from angle; 8, 9 stalked; 10, 11 free. Hind wing with vein 3 from angle of cell; 4, 5 shortly stalked; 6 from well below upper angle.

Fig. 52.



Gadira acerella, ♂. ¾.

Type. †Gadira acerella, Wlk. xxxv. 1742. New Zealand.
Botys mehanga, Feld. Reis. Nov. pl. 137. f. 27.

List of unrecognized Genera.

Seriocrambus stylatus, Wallengr. Eugenies Reise, Lep. p. 383, pl. 7. f. 7. Argentina.
Elethyia (*Prionopteryx*) *subscissa*, Christ. Hor. Ent. Ross. xii. p. 277, pl. vii. f. 18. Siberia.
Cephis galleriellus, Rag. Deutsch. e. Z., Lep. v. p. 295, pl. iii. f. 12. Tunis.
Pachymorphis subductellus, Möschl. Abh. Senck. Ges. xvi. p. 324. Porto Rico.
Epichilo parvellus, Rag. Ann. Soc. Ent. Fr. 1888, p. 278. S. India.
Tauroscopis gorgopis, Meyr. Tr. N. Z. Inst. xx. p. 69. New Zealand.

Species described as Crambinæ *which are omitted.*

Chilo carnifex, Cyl., from Madagascar, reference unknown.
Crambus patulellus, Wlk. xxvii. 163. Type lost, description not recognizable.
„ *sinensellus*, Wlk. xxvii. 167, belongs to the *Pyraustinæ*.
„ *concinalis*, Fthl. Mag. de Zoologie, 1839, pl. 26. f. 2, belongs to the *Tineidæ*.
„ *leucocinctus*, Wlk. xxvii. 169, belongs to the *Phycitinæ*.
„ *ruptellus*, Wlk. xxvii. 173, belongs to the *Deltoidinæ*.
„ *vetustellus*, Wlk. xxvii. 176=*cygnosellus*, Wlk. xxxv. 1758, belongs to the *Phycitinæ*.
„ *ochraceellus*, Wlk. xxvii. 177, belongs to the *Tortricinæ*.
Ciampa defixella, Wlk. xxvii. 180, belongs to the *Geometridæ*.
Themma divisa, Wlk. xxvii. 186=*Tunza promptella*, Wlk. 196=*Doryodes acutaria*, H.-S., belongs to the *Deltoidinæ*.
Juncaria nonagrioides, Wlk. xxvii. 187, belongs to the *Noctuidæ*.
Begunna xanthoides, Wlk. xxvii. 190, belongs to the *Tortricinæ*.
Safra metaphœella, Wlk. xxvii. 195, belongs to the *Tineidæ*.
Samana falcatella, Wlk. xxvii. 197, belongs to the *Geometridæ*.
Adena xanthialis, Wlk. xxvii. 198, belongs to the *Pyraustinæ*.
Acara morosella, Wlk. xxvii. 199, belongs to the *Galleriinæ*.
Zekelita equalisata, Wlk. xxvii. 199, belongs to the *Deltoidinæ*.
Aquita horridella, Wlk. xxvii. 200, belongs to the *Sarrothripinæ*.
Pharga fasciculella, Wlk. xxvii. 201. Type lost, description not recognizable.

Arucha indicatalis, Wlk. xxvii. 202=*Etiella zinckenella*, belongs to the *Phycitinæ*.

Affa bipunctella, Wlk. xxvii. 202, belongs to the *Tortricinæ*.

Phachthia lignigeralis, Wlk. xxx. 979, belongs to the *Deltoidinæ*.

Tomissa concisella, Wlk. xxx. 978. Type lost, description not recognizable.

Ancylolomia siccella, Wlk. xxxv. 1750, belongs to the *Tineidæ*.

Crambus indotatellus, Wlk. xxxv. 1752=*commixtalis*, Wlk., belongs to the *Pyraustinæ*.

„ *acutellus*, Wlk. xxxv. 1753=*venalis*, Grote, belongs to the *Pyraustinæ*.

„ *bogotanellus*, Wlk. xxxv. 1754=*helviusalis*, Wlk., belongs to the *Pyraustinæ*.

„ *aurifusellus*, Wlk. xxxv. 1756, belongs to the *Anerastiinæ*.

„ *melanospilellus*, Wlk. xxxv. 1759. Type lost, description not recognizable.

„ *dirutellus*, Wlk. xxxv. 1760. Type lost, description not recognizable.

Eromene apertella, Wlk. xxxv. 1762, belongs to the *Tortricidæ*.

Tauba venosella, Wlk. xxxv. 1767, belongs to the *Pyralidinæ*.

Ertzica maximella, Wlk. xxxv. 1768, belongs to the *Galleriinæ*.

Batiana remotella, Wlk. xxxv. 1771. Type lost, description not recognizable.

Rupela degenerella, Wlk. xxviii. 524, belongs to the *Lithosiinæ*.

Crambus fœdellus, Wlk. xxxv. 1757, belongs to the *Galleriinæ*.

„ *tincticostellus*, Wlk. xxvii. 167, belongs to the *Pyraustinæ*.

Catagela leucania, Feld. Reis. Nov. pl. 137. f. 13, belongs to the *Anerastiinæ*.

Crambus sabulosellus, Wlk. xxvii. 178, is a *Scoparia*.

„ *trivirgatus*, Feld. Reis. Nov. pl. 137. f. 29, is a *Scoparia*.

„ *rotuellus*, Feld. Reis. Nov. pl. 137. f. 30, is a *Scoparia*.

Eromene transcissella, Wlk. xxxv. 1762, belongs to the *Tortricinæ*.

Crambus humerellus, Wlk. xxxv. 1758, belongs to the *Tortricinæ*.

„ *submarginellus*, Wlk. xxxv. 1760, belongs to the *Tortricidæ*.

Mixophila renatusalis, Wlk. xvii. 484=*Crambus ermineus*, Moore, Lep. Ceyl. iii. p. 580, pl. 184. f. 7=*Angonia crambidalis*, Snell. Tijd. v. Ent. 1893, p. 56, pl. 3. f. 1, belongs to the *Hydrocampinæ*.

Crambus whiteleyi, Butl. Ill. Het. iii. p. 78, pl. 60. f. 2, is a *Hypena*.

„ *sabulinus*, Butl. A. M. N. H. 1879, iv. p. 455, belongs to the *Phycitinæ*.

„ *occultilinea*, Wlk. xxvii. 168. Type lost, description not recognizable.

Bulina solitella (*Libuna*, Moore, Lep. Ceyl. iii. p. 379), Wlk. xxxv. 1767. Type lost, description not recognizable.

Diptycophora inornata, Butl. Trans. Ent. Soc. 1886, p. 440, belongs to the *Noctuidæ*.

Suratha eremialis, Swinh. P. Z. S. 1889, p. 422, belongs to the *Pyralinæ*.

Ugra parallela, Wlk. xxvii. 189, belongs to the *Chrysauginæ*.

Cirrochrista diaphana, Hmpsn. Ill. Het. viii. p. 135, pl. 155. f. 11, belongs to the *Pyraustinæ*.

Pelena unicolor, Moore, Lep. Ceyl. iii. p. 386, pl. 184. f. 16, belongs to the *Hydrocampinæ*.

Taseopteryx sericea, Butl. Trans. Ent. Soc. 1883, p. 63, belongs to the *Deltoidinæ*.

Mctothemma angulipennis, Butl. Trans. Ent. Soc. 1883, p. 62, belongs to the *Deltoidinæ*.

,, *acuminata*, Butl. Trans. Ent. Soc. 1883, p. 62, belongs to the *Deltoidinæ*.

,, *striata*, Butl. Trans. Ent. Soc. 1883, p. 63, belongs to the *Deltoidinæ*.

Eromene vetustella, Wlk. xxxv. 1763, is a *Nola*.

Crambus perspicuus, Wlk. Ent. v. 155. Type lost, description not recognizable.

Addendum (Feb. 18, 1896).

Sedenia, Guen. Delt. & Pyr. p. 249 (1854), before *Eromene*, from which it is distinguished by the abortion of the proboscis.

Type. Sedenia cervalis, Guen. p. 250, pl. 3. f. 3=†*itonusalis*, Wlk. xviii. 794, and †*pictoalis*, xix. 1016. Australia.

Sedenia rupalis, Guen. p. 250. Australia.

6. On *Uintacrinus*: a Morphological Study.

By F. A. Bather, M.A.[1]

[Received December 3, 1895.]

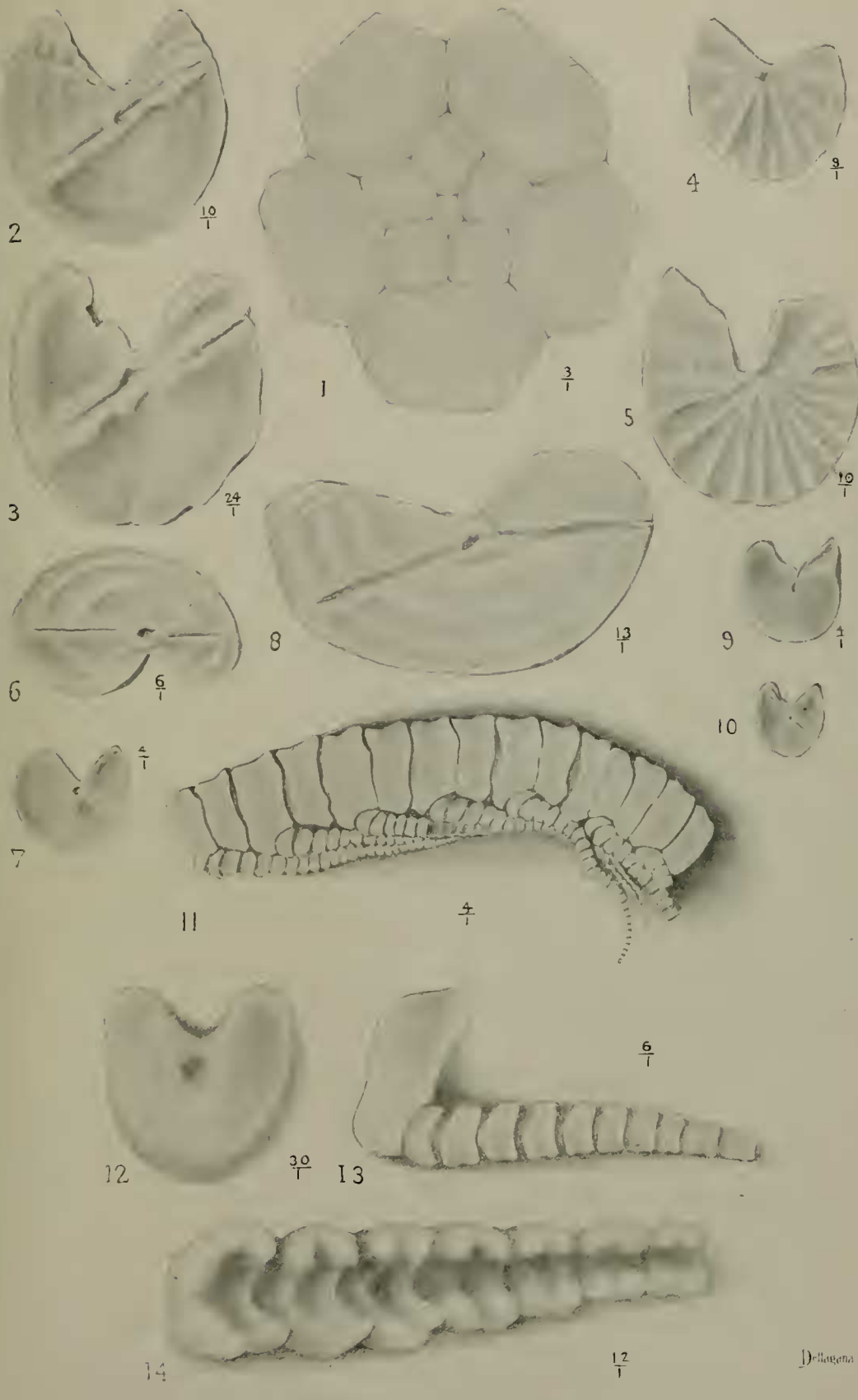
(Plates LIV., LV., & LVI.)

Contents.

1. Introduction and History of Discovery.

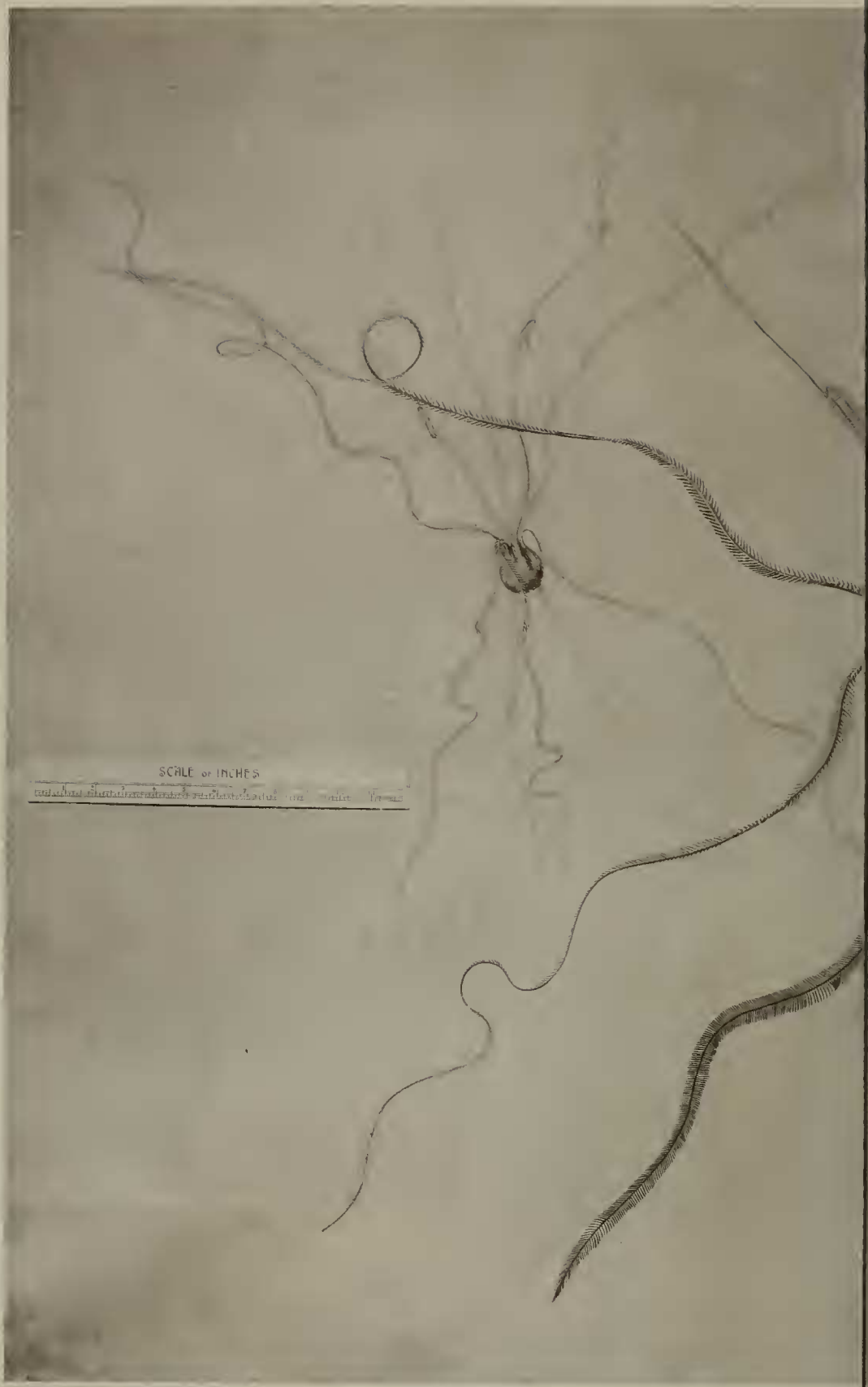
Among those extinct forms that have evoked the curiosity of naturalists, the peculiar unstalked crinoid *Uintacrinus* holds a foremost place. Not merely its rarity and its beauty have caused it to receive unusual attention, but also the circumstances that, though found in the Cretaceous rocks, it reminds one strongly of forms extinct since the Carboniferous period, and yet cannot be joined to them, so far as we are aware, by any chain of ancestors. Like the other unstalked and free-swimming crinoid of the Chalk, *Marsupites testudinarius*, it is a forlorn foundling, with not even a birth-mark to reveal its parentage. The riddle with which *Uintacrinus* perpetually challenges the naturalist may perhaps be

[1] Communicated by Sir W. H. Flower, K.C.B., P.Z.S.



UINTACRINUS SOCIALIS.


BRITISH MUSEUM
NATURAL HISTORY

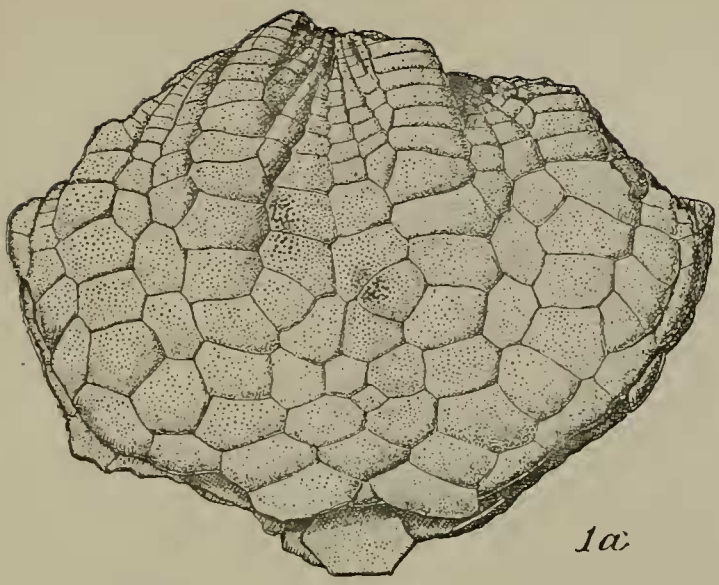


F. O. Pickard, Cambridge, del.

Restoration of UI

ACRINUS SOCIALIS.

Bemrose, Phototyp.



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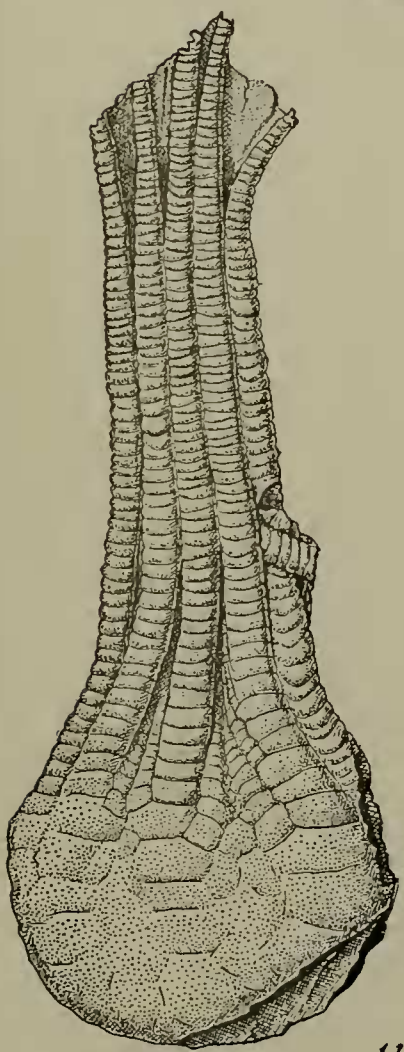

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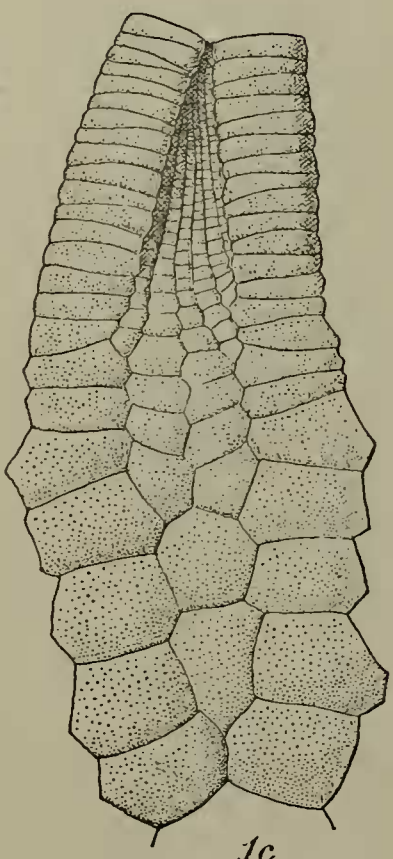

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C. R. Keyes del.

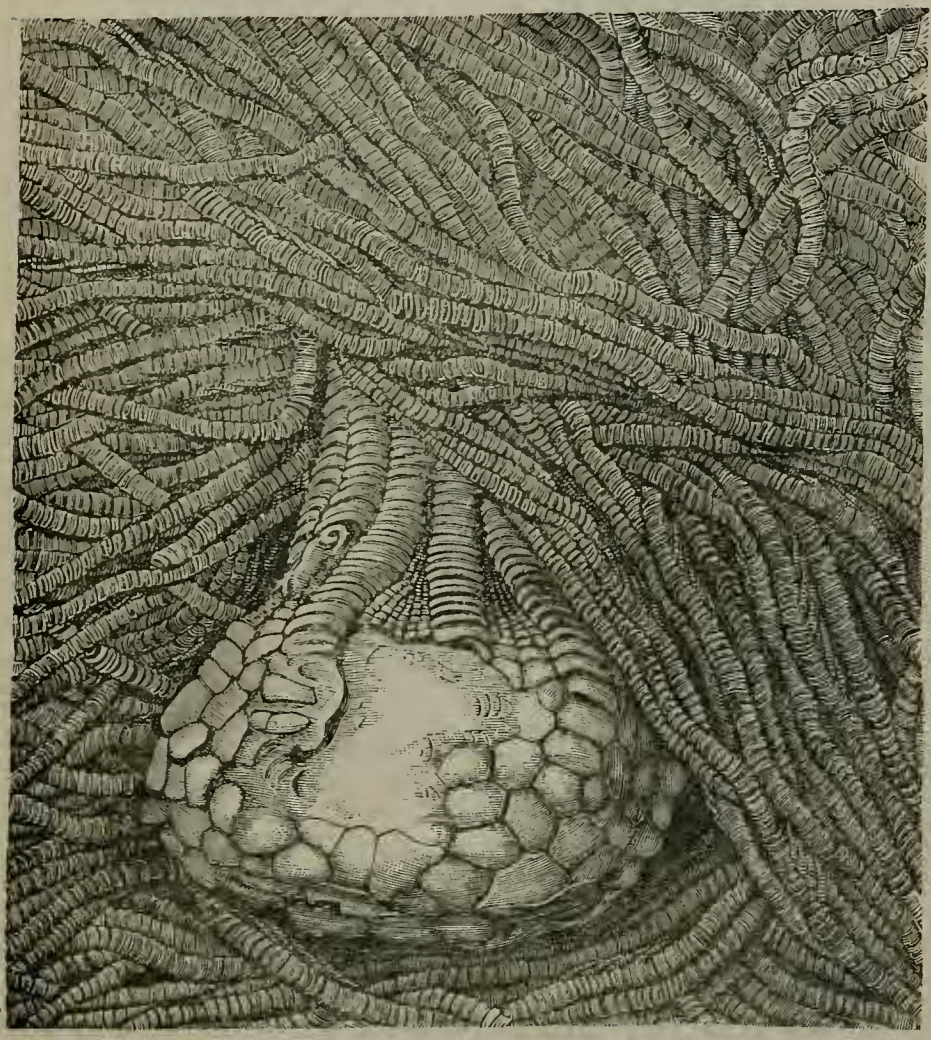
UINTACRINUS SOCIALIS.


NATURAL HISTORY

solved, not by renewed speculation, but with the aid of fresh facts and more detailed description. To bring such aid is the object of this paper.

It was in 1870 that, through one of the exploring expeditions of Prof. O. C. Marsh (1), an imperfect specimen was found in the eastern Uintah mountains, lying "in a stratum of yellow calcareous shale" and immediately over "a thin layer full of *Ostrea congesta*, Conrad, a typical Cretaceous fossil," and associated with the scales of a *Beryx*. This specimen was not sufficient for description, but in 1875 further specimens, somewhat exposed and weathered, were discovered by Prof. Mudge and his party in the middle of

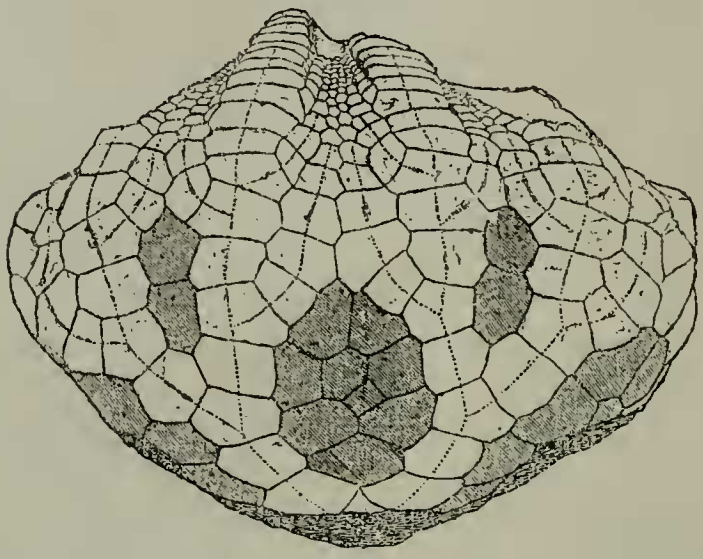
Fig. 1.



Uintacrinus socialis, one of the co-types, from Niobrara Chalk, W. Kansas, now in Yale College Museum. Reproduction of Grinnell's illustration, Amer. Journ. Sci. vol. xii. pl. iv. fig. 2. The lower portion of a weathered specimen is seen surrounded by a mass of arms belonging to other individuals. Natural size.

the Niobrara Chalk of Trigo Co., W. Kansas, associated with the Odontornithes, Pterodactyls, and Mosasauroid reptiles of that formation. One of these crinoids, which was sent to the Yale College Museum, served Grinnell as the type of genus and species, *Uintacrinus socialis*, which he described in 1876 (2). The specimens studied by him showed neither base nor arms clearly (fig. 1, p. 975). Some specimens sent at the same time from Prof. Mudge to F. B. Meek were well described by the latter (3), who added a few details concerning the interradial and interdistichal areas (fig. 2). Still there remained to be determined "the nature of the base (whether composed of five pieces surrounding a central piece, and whether or not it was connected with a column), the presence or absence of subradial pieces, and whether there is an anal series of pieces differing from each of [the other] interradial series."

Fig. 2.

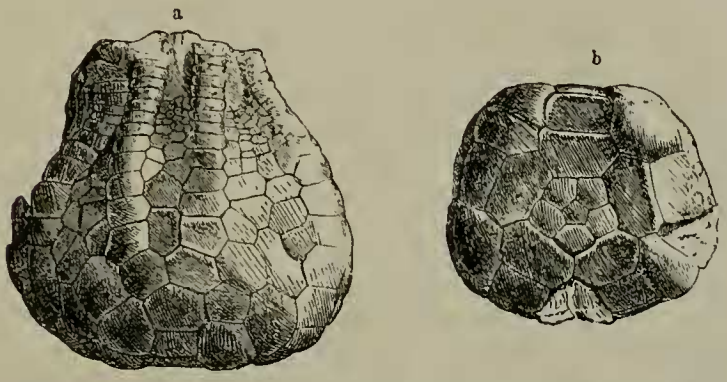


Uintacrinus socialis. Reproduction of Meek's fig. B, in Bull. U.S. Geol. & Geog. Survey, ii. p. 375. "A flattened specimen, [in which] all the body-plates of one side are seen. The plates of one interradial area (middle of figure) [interbrachials, *mihi*] and parts of two others, one on each side, as well as those of two of the interaxillary areas [interdistichals, *mihi*], are shaded to distinguish them from the plates of the radial system [fixed brachials, *mihi*], which latter are marked with dotted lines." Natural size. This specimen is in the U.S. National Museum, and has been re-figured by W. B. Clark (8). See page 982 and Pl. LVI. fig. 1 *a*.

Almost contemporaneously a specimen of this genus, but representative of another species, was discovered in Europe at a slightly higher horizon, namely in the lowest division of the Lower Senonian, in the *Marsupites* zone, near Recklinghausen in Westphalia. This was exhaustively described and discussed by Schlueter in 1878 (4), under the name *U. westfalicus* (fig. 3). In this specimen the arms were not well preserved; the base, which was clearly seen, confirmed the impression of previous writers that the genus was unstalked, and showed that there was but one

circlet of basals; the interradial and interdistichal areas were fairly visible all round the specimen, and though "the contour and disposition of the plates differed in the different interradii," there was no such variation as to point to the existence of a special anal series. It is chiefly in the arrangement of the interradial plates that this species differs from *U. socialis*.

Fig. 3.



Uintacrinus westfalicus, type-specimen from the Lower Senonian of Recklinghausen, now in the Museum of Bonn University. *a*, from the side; *b*, from below. The illustration, reproduced from Zittel (**5**) p. 374 & (**11**) p. 139, by kind permission of Prof. Karl von Zittel, is a *reversed* copy of Schlueter (**4**) pl. iv. figs. 1 & 2, reduced to $\frac{1}{3}$ natural size, *not* natural size as invariably stated.

The American species was more fully described by W. B. Clark in 1893 (**8**), but his specimens did not throw much more decided light on its structure (Pl. LVI.). In the following year, however, S. W. Williston and B. H. Hill (**9**) published some notes on specimens discovered in 1891 by Prof. E. E. Slosson. These specimens were the first among those found in America to show the base with the desired clearness, and were in other respects far superior to any specimens of *U. socialis* previously collected. They were found near Elkader, on the Smoky Hill River, W. Kansas, and their mode of occurrence is thus described by Prof. Williston:—"While all the colonies hitherto discovered have been exposed and more or less weathered, the present one was found in position, covered by the soft blue shale. The animals had lived so closely together that their very long arms had become inextricably entangled, and, by consolidation, had formed a dense calcareous plate, about one-third of an inch in thickness in the middle of the plate, but thinning out at the margin. About one-half of the thin slab as thus formed had been washed away; the remainder, as now restored in the University Museum, measures about six feet by three or four, and has upon its underside nearly one hundred of the crinoids, the greater part of which are perfectly preserved. The calyces all lie flattened out, showing, in some cases, the basal plates, but, as might be expected, never the upper or ventral portions. The interlacing of the arms prevents the tracing of any to the extremity."

Two slabs from the same locality, collected by Mr. H. T. Martin, have recently been purchased by the Trustees of the British Museum. Since they are the only specimens of the genus in England, and probably the only specimens of *U. socialis* as yet received in Europe[1], the description of them that Dr. Henry Woodward has kindly permitted me to draw up may interest English naturalists. At the same time, the more careful investigation that these exceedingly beautiful specimens have rendered possible has enabled a few details to be more accurately filled in.

The larger of the two slabs has an irregular area of about 2400 sq. cm., and contains 23 cups, one of which shows the base very clearly; the arms are also well shown. This slab represents the unweathered condition of the fossil; the matrix is a soft, calcareous yellow shale, in general aspect reminding one of the Solenhofen Lithographic Stone, but much softer and more friable. According to Prof. S. Calvin[2], it is composed of microscopic organisms identical with those of true chalk. Where the crinoids are massed together, their calcareous remains form, as described by Prof. Williston, a dense plate. As a rule, however, the separate plates and ossicles of the crinoid are far too easily detached from the matrix. The calyces are flattened out, and the arm-ossicles also are much compressed, so that their examination is not easy. This slab, registered E 6527, is now exhibited in Gallery No. 8 of the Geological Department of the British Museum (Nat. Hist.). For convenience of reference the cups contained on it have been lettered *a*, *b*, *c*, &c.

The smaller of the two slabs, with an area of 420 sq. cm., contains the remains of 7 cups, of which three show the basal circlet. This slab represents the weathered condition of the fossil, which fact, however, rather facilitates than hinders study. The shale is a pale bluish grey, and the pale yellow plates stand out clearly, both in colour and relief. This slab is registered E 6328, and the cups are lettered α, β, γ, &c.

Both these slabs show a feature of fossilization hitherto unnoticed in *Uintacrinus*; in fact, so far as I am aware, unknown among crinoids. That is, the preservation of a thin layer of carbonaceous material, which lines the interior of the calyx. Unfortunately, the traces of microscopic structure exhibited by this are of the most meagre description.

2. Morphological Description of Uintacrinus socialis.

The crinoid consists of a crown only. There is no trace of a stem, unless, indeed, the central apical plate be the diminished representative of the proximal columnal, for which view there is no evidence.

[1] Geh. Professor Karl von Zittel informs me, in a letter dated January 18, that the Munich Museum has also acquired similar specimens.

[2] "The Niobrara Chalk." Presidential Address, Proc. Amer. Assoc. xliii. pp. 197–217 (1894); and in a private letter to the author, January 1896.

The **crown** consists of a relatively large, globose calyx and 10 long arm-branches (Pl. LV.).

The **calyx** was flexible, as shown by the thinness of the component plates, the absence of fractures, and the regularity of the preserved specimens. The dorsal cup alone is known to us. The **tegmen** was pliable, and probably but slightly, if at all, plated; at any rate, none of the ventral plates are exposed, "nor," as says Mr. Hill (9), "has it been possible to expose them by dissecting away the plates." Neither does a transverse section of a calyx, at about the level of the 6th fixed distichal, show more than a confused calcareous mass.

The **dorsal cup** (see figs. 4 and 5) consists of three categories of elements: (*a*) the apical system; (*b*) the brachial elements, which are radial and primary; (*c*) the secondary, supplemental plates, viz. (i.) interbrachials, (ii.) interdistichals, (iii.) interpinnulars.

The **apical system** (Pl. LIV. fig. 1) consists of (i.) the centrale or central apical plate; (ii.) 5 interradially situate basals surrounding it; (iii.) 5 radials succeeding the basals.

The **centrale** is pentagonal, but in specimens examined not quite regular. In specimen *e* its greatest diameter is 1·5 mm. It is perfectly smooth, showing no signs either of a stem-attachment or of partition into more than one original element. Its homologies are therefore doubtful, as its structure and position permit it to represent either a relic of a stem, or a fused infrabasal circlet, or even, as some would have it, an additional element altogether to which the name "dorsocentral" might be strictly applicable. I have recently[1] given reasons for rejecting the term and the idea "dorsocentral." Which of the other alternatives be correct is to be decided, if at all, by reference to the affinities and origin of the genus, as to which we are, at this stage of the inquiry, quite in the dark.

The **basals** (Pl. LIV. fig. 1) are 5, equal, regular, and pentagonal. They surround the apical plate and meet each other by adjacent sides. The sides enclosing the upper angle of each basal are slightly curved convexly, thus giving the basals a petaloid aspect. The measurements of the basals in specimen *e* are: height 3·4 mm.; width below, 1·0 mm.; width above, 3·5 mm.

The **radials** (fig. 5 and Pl. LIV. fig. 1) are 5, equal, heptagonal or hexagonal according as the upper sides of the two basals on which each radial rests make a reëntrant angle or a straight line. They meet each other by adjacent sides, support the first primibrachs above, and abut on the proximal interbrachials on either side. Their measurements in specimen *e* are: in one radius, height 5·0 mm.; width below, 4·9 mm.; width in middle, 8·7 mm.; width above, 5·75 mm.: in another radius, height 6·0 mm.; width below, 4·5 mm.; width in middle, 8·0 mm.; width above, 4·5 mm.

The **fixed brachial** elements that enter into the composition of

[1] "The Text-book Writer among the Echinoderms," Natural Science, vol. vi. pp. 415–423 (1895).

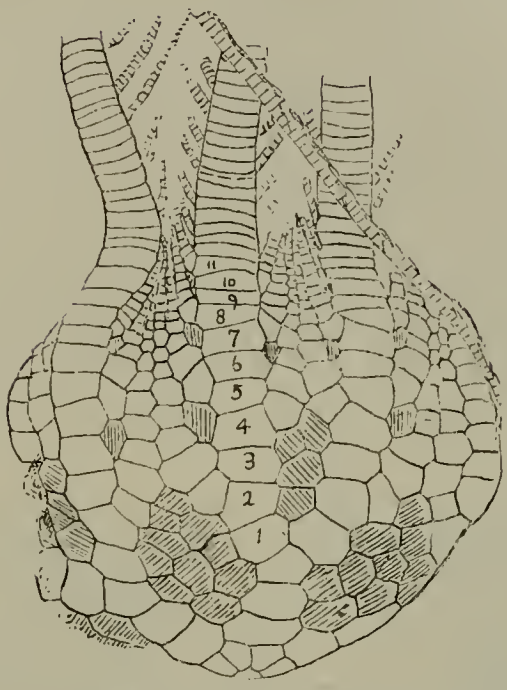
the dorsal cup consist of (i.) primibrachs, IBr; (ii.) secundibrachs or distichals, IIBr; (iii.) fixed pinnules. By "fixed" one means that the ossicles in each longitudinal series are attached not merely to one another by their upper and lower margins, but also to the ossicles of adjacent series by their lateral margins, thus forming the cup. The precise limits of fixation are not very easy to determine in the fossil state: for instance, the distal extremities of the earlier pinnules were undoubtedly free, although their proximal portions were firmly united laterally to the distichals or to other pinnules; but the exact point at which lateral union ceased cannot be determined, since, even above the limits of strict lateral sutures, the pinnules may have been laterally united by a membrane. The same uncertainty prevents us from saying at what level the arms became free; but we may say somewhere about the 8th and 9th distichal, $IIBr_9$.

The **primibrachs** ("radials of the first order" in part, or "costals," of some writers) are two in number (see figs. 4 and 5). IBr_1 is hexagonal, resting by its lower edge on the feebly concave upper margin of the radial, supporting IBr_2 on its upper margin, and abutting laterally on two interbrachials on either side. It is slightly less wide than the radial, but about the same height. IBr_2 is axillary (IAx) and pentagonal, having on rare occasions an irregularity in the lateral margin, owing to the abutment thereon of more than one interbrachial.

The **fixed secundibrachs** (or fixed distichals) may, as aforesaid, be reckoned at about 8. They are fixed by means of interbrachials, fixed pinnules, and interdistichals. Owing to the origin from some of them of the fixed pinnules, they have a slightly irregular, zigzag arrangement, and those that bear pinnules have somewhat the aspect of axillaries. The law of their pinnulation, in both right and left branches of each arm, may be stated thus: $IIBr_1$, none; $IIBr_2$, outer; $IIBr_3$, none; $IIBr_4$, inner; $IIBr_5$, outer; $IIBr_6$, none; $IIBr_7$, inner; $IIBr_8$, outer; $IIBr_9$, none. This, at least, is the arrangement I have found in eight specimens out of ten, *e. g.* specimens *γ*, *d*, *e*, *f*, *g*, *l* (figs. 4, 5, 10). One of the ten specimens, viz. *b* (fig. 6), varies thus: $IIBr_6$, inner; $IIBr_7$, none; $IIBr_8$, outer; $IIBr_9$, inner. The remaining one, viz. *p* (fig. 7), varies thus: $IIBr_5$, none; $IIBr_6$, outer; $IIBr_7$, inner; $IIBr_8$, none; $IIBr_9$, outer. In both these cases the regular alternation of pinnules remains. It appears that all the rays of any individual vary, if they vary, according to the same plan.

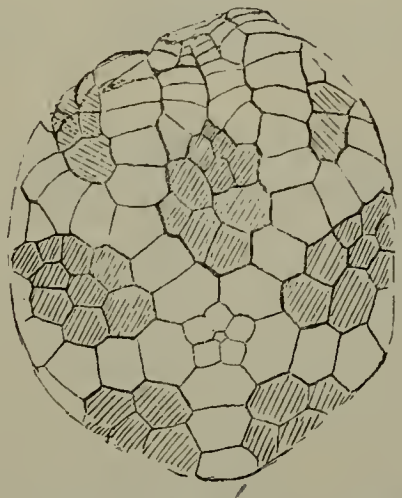
The above results were gained from an examination of actual specimens in the British Museum: it is instructive to compare them with the published figures. Grinnell's (2) figures 1 and 2 (my fig. 1) agree with the law so far as the portions in question are preserved. Both of Meek's (3) figures (my fig. 2) agree with it in every particular. Prof. Clark's (8) "Diagram showing the structural arrangement of the plates in the test" agrees with it. Clark's pl. i. fig. 1*a* (Pl. LVI.) shows the following arrangement in two branches:—$IIBr_5$, outer; $IIBr_6$, none; $IIBr_7$, outer. Not

Fig. 4.



Uintacrinus socialis, Brit. Mus. E 6328, γ. In this, as in figs. 5–12, the plates of the apical and radial systems are left white, the fixed distichals being numbered, and the supplementary plates are shaded as follows:—interbrachials, from right to left; interdistichals, from left to right; interpinnulars, vertically. An arm-fragment of another individual lies athwart the upper part of the portion drawn. Natural size.

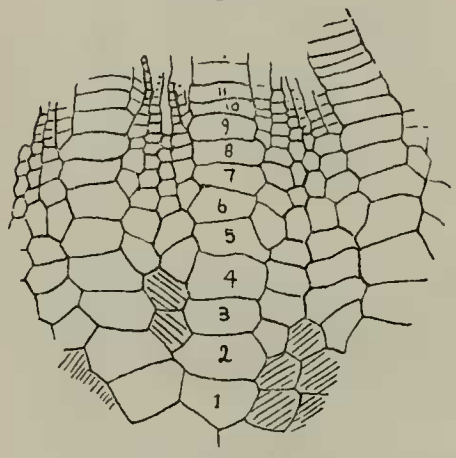
Fig. 5.



Uintacrinus socialis, Brit. Mus. E 6527, *e*. A cup seen from below, shaded as in fig. 4. Natural size.

only do the two other branches agree with the law, but this arrangement violates the fundamental law of alternation of pinnules, so that I have little doubt the figure is incorrect. Clark's pl. i. fig. 1*c* (Pl. LVI.) agrees with the law except for the fact that $IIBr_9$ in the right-hand branch bears an inner pinnule, while in the left-hand branch it bears none. I have little doubt that this pinnule is incorrect. It is not merely because they are inconsistent with my own observations that I cast doubt on Prof. Clark's figures; but because they are inconsistent, each in itself, each with his other figures, and each with his own statements on p. 23. There is also internal evidence to show that Clark's fig. 1*a* of pl. i. is drawn from the same specimen as Meek's fig. B. If Meek is, as there is reason to believe, correct, then Clark is wrong. It is only fair to Prof. Clark to remember that the drawings here criticized were

Fig. 6. Fig. 7.



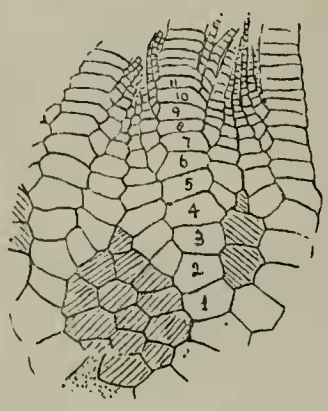


Fig. 6.—*Uintacrinus socialis*, part of Brit. Mus. E 6527, *b*, showing fixed distichals and pinnules. Natural size.

Fig. 7.—*Uintacrinus socialis*, part of Brit. Mus. E 6527, *p*, showing fixed distichals and pinnules, interbrachials, and interdistichals. Natural size.

made by Mr. C. R. Keyes, whose work is usually trustworthy, and whose acquaintance with fossil crinoids is considerable. Mr. B. H. Hill's (9) diagram shows the following arrangement, so far as I can decipher his rather peculiar mode of representation :— $IIBr_1$, none; $IIBr_2$, outer; $IIBr_3$, inner; $IIBr_4$, outer; $IIBr_5$, inner; $IIBr_6$, outer; $IIBr_7$, inner; $IIBr_8$, outer; $IIBr_9$, inner. Now this is so absolutely inconsistent with the law, with the type-specimens, with known variations, and with the general structure of *U. socialis*, that it can only be supposed either that Mr. Hill's diagram is hopelessly incorrect, which I should be sorry to think, or that he has unwittingly figured a new species, which I find it hard to believe, especially as Prof. Williston (9) shows himself fully alive to the possibility of there being more than one American species, and would have noted the fact quickly enough.

Here, moreover, it is to be noticed that the law stated above applies equally to *U. westfalicus* (fig. 3), and therefore probably is the law for the whole genus.

It is unnecessary to describe the fixed secundibrachs in detail. They are flat, thin plates, with no trace of any axial canal, either in section, or superficially in the form of an axial ridge. They are about the same width as the immediately succeeding free brachials, but are much higher. In the latter respect, however, no line of demarcation can be drawn between fixed and free, since the change, though rapid, is not sudden.

The **fixed pinnules** arising from the fixed secundibrachs unite with one another and with the interdistichals (or interaxillary) and interbrachial plates to form the interdistichal and interbrachial (or interradial) areas of the dorsal cup. Each interbrachial area of an adult contains 3 pinnules on either side; and each interdistichal area contains 2 pinnules on either side (fig. 8). But only

Fig. 8. Fig. 9.

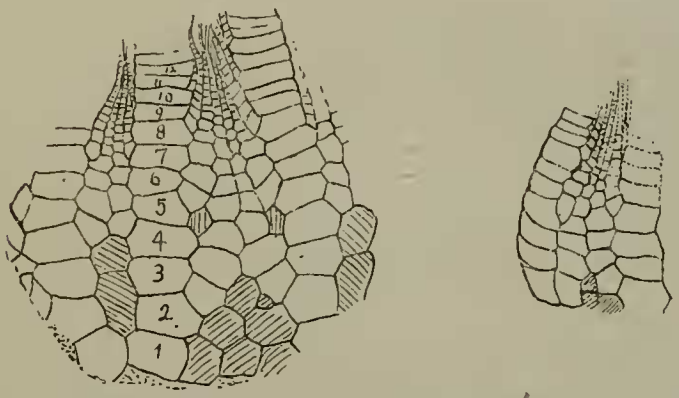


Fig. 8.—*Uintacrinus socialis*, part of Brit. Mus. E 6527, *f*, showing fixed distichals and pinnules, interdistichals, and interpinnulars.

Fig. 9.—Fixed pinnules of ditto from Brit. Mus. E 6527, *q*. Both figures natural size.

the proximal portions of the pinnules are fixed; the distal portions must have been freely movable and quite independent. The amount of fixation, and the number of pinnules involved, increase with age. A young individual, viz. *q* (fig. 9), shows only two pairs of pinnules in an interbrachial area; and the proximal of these appears to have only 5 ossicles fixed or modified by fixation, whereas an older individual, viz. *d* (fig. 10), clearly shows 9 in that state. In old individuals, even a fourth pair of pinnules may have been involved in the interbrachial area. The proximal fixed ossicles of these pinnules are large flat plates, both wider and higher than the succeeding free ossicles. They show no trace of any axial canal in the proximal region. The flattened plates of the fixed portions of the pinnules do not form horizontal rows across the areas, but alternate with one another, assuming a hexagonal outline.

Schlueter (4) says (p. 58), with reference to the corresponding structures in *U. westfalicus*—"If one were possibly inclined to regard as side-arms, or indeed as pinnules, those rows of plates that . . . lie between the arms and the arm-branches, this would be forbidden by the constitution of the plates, since they possess neither a central canal nor a ventral groove, and are united to one another by simple sutures." This argument, though adopted by Neumayr (6), is one I am unable to accept. The absence of a central or axial canal is nothing, since there is none in the arms of many Palæozoic crinoids: it is, however, a statement that I have been unable to verify in *U. socialis* so far as the free distal ends of the fixed pinnules are concerned. It is abundantly clear that the free ossicles in the pinnules are of the same character, and are united in the same way, as the ossicles of the subsequent free pinnules. It has also been shown that the fixation of the pinnules is a gradual process. There is therefore no reason to suppose that the fixed pinnules are anything else than pinnules whose bases have become partially fixed, an occurrence by no means rare in other genera.

The **supplementary plates** are of three kinds: interbrachials, interdistichals, and interpinnulars. They are all thin flat plates, and vary considerably in shape and even in number.

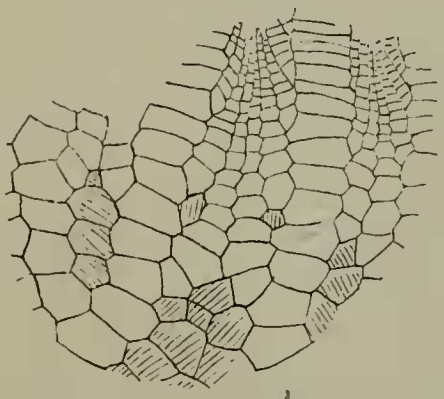
The **interbrachials** vary in number from 7 (*fide* B. H. Hill, 9) or 8 (*fide* Clark, 8) to 12, e. g. *p* (fig. 7). In the specimens examined by me, 10 appears to be the most usual number, e. g. γ, ϵ, *e* (figs. 4, 5), and I have never seen fewer than 9. In each interradius these plates all lie above the two adjacent radials, between the fixed primibrachs and opposing fixed secundibrachs 1 and 2, and below the 1st and 2nd ossicles of the proximal, outer or interradiad, fixed pinnules. Clark says: "The arrangement of the plates does not vary; seven in an oval band enclose the 8th, or 8th and 9th, according to the number of interradials." This may be accepted as the simplest type of arrangement; but there is considerably more variation than admitted by Clark. The only stable plate is the proximal one, which rests on the upper lateral margin of two adjacent radials, and abuts laterally on the two IBr_1. Its upper margin supports the two succeeding interbrachials, but may also support the central interbrachial between them. To describe the shapes and positions of all the other interbrachials would, considering their variation, be waste of time. It is only necessary to point out that, in the large majority of the specimens before me, e. g. γ, *e*, *d*, *p* (figs. 4, 5, 10, 7), there is a single plate lying between the two proximal pinnules and the two subjacent interbrachials, and separated by those two interbrachials from the central interbrachial. This distal plate is not shown by Meek (3), or Clark, or Hill; but it can be seen in Grinnell's (2) fig. 1, although there it rests on a single interbrachial, and not on two as is usual. The particular arrangement of interbrachials figured by Meek and by Clark is unrepresented among the specimens in the British Museum; but there is no reason to doubt the

accuracy of the figures. Were it not for the fact that Mr. Hill's diagram has already woefully failed us, one would not doubt it any more than Clark's; but till Mr. Hill has explained how the various plates of his analysis can be fitted together, his drawing must inevitably be neglected.

Despite the considerable variation among the interbrachials, there is no evidence to show that in a single individual any one of the interradii was so different from the others as to suggest its being an anal interradius.

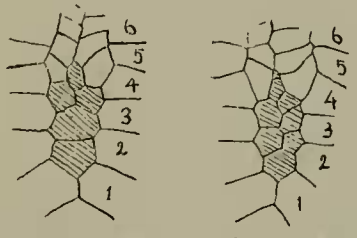
The **interdistichals** have been described by all previous writers as two in number. Certainly this number preponderates; but 20 specimens in the British Museum, of which 28 interdistichal areas can be examined, show 2 interdistichals in 10 areas, e. g. *b*, *f* (figs. 6, 8), 3 in 6 areas, e. g. *p* (fig. 7), 4 in 6 areas, e. g. γ, *l* (fig. 4), 4 or 5 in 1 area, 5 in 4 areas, e. g. *d*, *k*, *g* (figs. 10, 11), and 8 in

Fig. 10.



Uintacrinus socialis, part of Brit. Mus. E 6527, *d*, showing fixed distichals and pinnules, interbrachials, interdistichals, and interpinnulars. Natural size.

Fig. 11. Fig. 12.



Uintacrinus socialis, interdistichal areas of Brit. Mus. E 6527, *k* (fig. 11), and E 6528, α (fig. 12). Natural size.

1 area, viz. in α (fig. 12). The interdistichals are surrounded by $\overline{\text{II}}\widetilde{\text{Br}}_{1,2,3,4}$ and by one or two ossicles of the proximal radiad pinnules. The proximal interdistichal is usually heptagonal, and abuts on $\overline{\text{II}}\overline{\text{Br}}_{1,2,\&3}$ and on the succeeding interdistichal. It may, however, not reach so high as $\text{II}\overline{\text{Br}}_3$, and it may not sink

so low as $IIBr_1$. The succeeding interdistichal usually stretches across the interdistichal area, but it may be split longitudinally in two. Also it may be succeeded by more interdistichals, from 1 to 5. The number of interdistichals is not necessarily constant in the interdistichal areas of one individual. Considering this extensive variation, it is a little odd that it should not have been noticed by any of the American writers. Similar variation is not known in the unique specimen of *U. westfalicus*, which in this portion of its anatomy agrees with the normal *U. socialis*.

The **interpinnulars** are small plates that are often intercalated in the spaces between the proximal portions of the fixed pinnules and the intervening $\overline{IIBr}$. There is usually only one interpinnular between two adjacent pinnules, but sometimes there are two. An interpinnular on one side of an area has usually a corresponding interpinnular on the other side. The interpinnulars are quite common: I have seen them in about half of the specimens under examination, e. g. γ, ϵ, d, f, g, k, l (figs. 4, 5, 8, 10, 11), and it is a little curious that they are neither figured nor mentioned by any previous writers.

We have seen that the fixed pinnules probably arose from free pinnules becoming involved in the construction of the cup. We may inquire now as to the origin of the interbrachials and interdistichals. Are they derived in whole or part from pinnules, or from the tegmen; or are they mere supplementary plates? The variation in number might show that they are degenerate pinnular elements; but it is equally consonant with the theory of their supplemental origin. There is the very slightest trace of any linear arrangement, and in such rare cases as might plausibly be imagined to represent a degenerate pinnule, such an assumption would upset the regular sequence of pinnulation; so that one cannot adopt this view without further proof. I can distinguish no difference in this respect between young and old individuals. The constancy of the proximal interbrachial might lead one to regard it as a primitive tegminal element, since an interradially situate plate of the tegmen is often conspicuous in just such a position. But the proximal interdistichal, which can scarcely be a primitive tegminal element, is nearly as constant. The presence of interpinnulars, which are undoubtedly intercalated, supplementary plates, show how all these plates may have arisen. Considered as supplementary plates, the interbrachials may primitively belong to either the cup or the tegmen; one can regard all interbrachial plates as portions of the tegmen that have become included in the dorsal cup.

The general relations of all the component elements and areas of the dorsal cup to one another are as follows:—The fixed primibrachs and secundibrachs form slightly raised ridges, more prominent distalwards. The interbrachial areas, including interbrachials, fixed pinnules, and interpinnulars, are slightly depressed at the sides, but form a slightly elevated shield-like area. The interdistichal areas are depressed. These points are more obvious

to touch than to sight. Each plate is slightly convex, and shows no traces of ornament or of radiate structure. Clark (8) describes the sutures between the cup-plates as "generally slightly channelled"; there are in the British Museum specimens a few obscure indications of irregular vertical groovings in the sides of the plates, which are no doubt the channellings to which Clark alludes. The number and thinness of the plates in the cup would be enough to give it the flexibility which it clearly possessed: hence elaborate sutures, as in *Marsupites* or in some *Platycrini*, were unnecessary.

The **arm-branches** are the free continuations of the fixed secundibrachs or distichal series, and are therefore 10 in number. They are composed of brachials and pinnules.

As to the length of the arm-branches, Grinnell (2) said "it seems probable that in life the spread of the outstretched arms may have been two feet or more." In the words of Meek (3), "Mr. Grinnell thinks they may have attained a length of not less than one foot." Both Clark (8) and Hill (9) quote Grinnell as saying that the arms reached 2 feet in length, which he did not say. The longest arm-fragment yet measured is that which Hill "traced for seventeen inches," but it is not stated whether this was traced up to the dorsal cup or no. The following measurements are from specimens in the British Museum :—

Description of portion measured.	Length of fragment.	Width of Brachials in mm.	Height of Brachials in mm.
Large specimen, beginning at $IIBr_3$	19·0 cm.	7·0 to 4·0	1·4, 1·45, 1·2
Smaller individual, ditto	23·5 cm.	6·75 to 2·5	1·36, 1·2, ·95
Isolated fragment	22·0 cm.	3·2 to 2·5	1·4, 1·2
„ „	18·0 cm.	2·5 to 2·0	1·0, ·95
„ „	23·5 cm.	2·5 to 2·0	1·25, 1·1
„ „	13·8 cm.	2·0 to 1·5	·9, ·85
Finials	3·5 cm.	1·0 to ·8	·65

Making allowances for some of these examples belonging to youthful individuals, we note that the rate of tapering is very gradual, that it is rapid in the immediately proximal portion of the arm-branch, but becomes much less distalwards. Similarly the decrease in height of the brachials is very gradual; it actually seems to increase at first in some cases, and then to lessen slowly. Let us allow 10 cm. in each arm-branch for the proximal irregularities; then, taking it that the width has to decrease from 4 mm. to 8 mm., and that the rate of decrease is ·5 mm. in 15 cm. (which is rather

more th[illegible] (the average), we conclude that the total length must be 10 cm. + 96 cm. = 106 cm. Similarly, taking it that the height of a brachial has to decrease from 1·4 mm. to ·65 mm. and that the rate of decrease is, at the utmost, ·2 mm. in 20 cm., then we conclude that the total length was not less than 10 cm. + 80 cm. = 90 cm. This latter method is not quite so reliable as the former, since measurements are more difficult to make, and since syzygies interfere with the striking of a correct average. But we are certainly justified in concluding that in an adult the length of a free arm-branch, counting from the suture between the eighth and ninth secundibrach, was certainly not less than 100 cm., or about 3 feet $3\frac{1}{2}$ inches, and that it contained fully 1000 brachials. Consequently, to adapt the words of the first describer of this crinoid, "it seems probable that in life the spread of the outstretched arms may have been" 6 feet 9 inches "or more." The longest arms in other crinoids are about 26 cm., or $10\frac{1}{4}$ inches, in *Extracrinus* from Boll, and about 22 cm., or a little under 9 inches, in *Scaphiocrinus swallowi* from the Carboniferous of North America. Enormous though the length is, as compared with that attained by other crinoids, the drawing of a reconstructed individual shows that it is by no means excessive when compared with the size of the dorsal cup (Plate LV.).

The arm-branches are found stretched along ventralwards, or opened at right angles to the cup, or bent back aborally, sometimes straight, sometimes curved, sometimes coiled round in a loop of half an inch or less in diameter. It is clear that they had great power of motion in all directions; and this is borne out by the structure of the brachials.

The **brachials** are usually compressed along different axes, according as they lie on the slab, so that it is hard to estimate their exact shape. It appears that the more proximal brachials were wider than deep (Pl. LIV. figs. 6, 8), while the more distal ones were deeper than wide (Pl. LIV. figs. 2, 5), also that the more distal brachials were higher in proportion than the more proximal ones. Owing to the pinnulation, the sutures between the brachials are not parallel, but slope alternately right and left. This feature, which was marked in the fixed brachials, is barely perceptible in the more proximal free brachials, but increases distalwards. The more proximal brachials are smoothly and regularly rounded; but the more distal ones become excavate and develop a clearly marked ridge, or cornice, on their distal margins, which ridge is more intense on the side towards the pinnule (Pl. LIV. fig. 11).

The ventral groove is **V**-shaped. In the more proximal brachials it is wide and enclosed by convexly curved sides (Pl. LIV. fig. 6); in the more distal brachials it becomes gradually deeper and is enclosed by straight sides (Pl. LIV. figs. 2, 5). Covering plates to the ventral groove have not been observed; probably they were small and lay, separate from one another, in a membrane, and so would not readily be preserved *in situ*.

The **joints** between the brachials are of two kinds: perforate articulation, and syzygial suture.

The **perforate articulation** is represented in figs. 2, 3, 6, 7, 8, 9, 10 of Pl. LIV. The axial canal perforates the brachial at a very short distance from the bottom of the ventral groove. Two parallel ridges run across the under or proximal surface of the brachial, coalescing around the axial canal. These ridges fit into a corresponding groove on the upper surface of the subjacent brachial, which groove itself appears to be bounded by slight ridges. No specimen shows a single fulcral ridge, with median perforation, such as is shown in Clark's (8) pl. ii. fig. 1 *e*. Owing to the state of preservation, and to the difficulty of seeing more than one side of any brachial, one cannot certainly distinguish between the proximal and distal surfaces, except when there is other evidence available. The direction of the ridges is not straight across the width of the brachial, but is diagonal; and I think that on the distal surface the end towards the pinnule-bearing side is moved dorsalwards, as is the case in *Pentacrinus*. Since the pinnules alternate from right to left, it follows that the direction of the diagonals must also alternate; so that, as is actually the case, the successive diagonals must lie almost, or quite, at right angles to one another (compare figs. 2 & 10 of Pl. LIV.). This skewing of the ridges is quite obvious and well-marked over the greater part of the arm; but in the more proximal region, where the brachials are still wide, and have rounded sides to the ventral groove, this skewing is not so marked (Pl. LIV. fig. 8). A most careful search has, however, failed to disclose a single brachial with a symmetry like that of Clark's (8) pl. ii. fig. 1 *e*, although one can find in the proximal region brachials more like Schlueter's (4) pl. iv. fig. 5, *a*, *b*, which is still asymmetrical (see Pl. LIV. fig. 6). Sometimes half the ridge appears to be more skewed than the other half, as in Pl. LIV. fig. 8. The position of the muscles and ligaments is not easy to determine. There was, no doubt, a bundle of ligament-fibres on the outer or dorsal side of the ridge; and according as the ridge was twisted to left or right, the area of attachment for these fibres must have moved alternately right and left. There is a faint depression over this part of the joint-surface. One would naturally assume a bundle of muscle-fibres in the area on either side of the ventral groove, and ventrad of the ridge; but when the ridge is skewed this area becomes large on one side, and almost non-existent on the other. In the larger area one can easily make out a depression for the attachment of the fibres; while in the smaller area one can often distinguish a strong elongate groove, parallel with the fulcral ridge, and this groove must represent the concentrated area of attachment of the fibres of this side.

It is clear that this skewing of the fulcral ridges must have given the arms great power of motion, not merely up and down as in *Antedon*, but from side to side. In this respect the arrangement is analogous to that in the stem of the Bourgueticrinidæ, and,

in a less degree, to the twisted stem of the Platycrinidæ. The advantage which such an arrangement of arm-joints confers on a free-swimming crinoid is obvious, since the animal is thereby enabled to progress more rapidly in any desired direction.

The origin of this skewing may be connected with the pinnulation of the arm. Each pinnule-bearing brachial is essentially an axillary. An axillary normally has two joint-surfaces and two fulcral ridges at its distal end; and these ridges are not parallel to the transverse axis of the ossicle, but converge dorsalwards. As one branch diminishes and becomes a pinnule, the joint-surface on that side also diminishes, while the other joint-surface comes to occupy the greater width of the ossicle, and its ridge becomes parallel with the transverse axis of the ossicle. We may suppose that in *Uintacrinus* the slanting of the ridge was maintained, though the ossicle underwent the usual changes. It is of course the case that in the pinnulate arms of other crinoids, e. g. *Pentacrinus* and *Metacrinus*, there is an asymmetry of the joint-surface, due to pinnulation, as was long ago well described by Johannes Müller[1]; but I can find no instance of a skewing so marked as in *Uintacrinus*.

The **syzygies** are of the type common in the *Antedonidæ* (Pl. LIV. figs. 4, 5). From the periphery of the brachial clearly defined ridges converge to the axial canal. All the ridges do not reach the axial canal, but only alternate ones, or sometimes one in three. The ridges near the medio-dorsal line are the more marked. The space between the ridges seems to be wider than the ridges themselves; nevertheless I have been unable to distinguish between the upper and lower surfaces of the joint. Sometimes the ridges are slightly channelled. The figure given by Clark (8) seems incorrect in being so symmetrical, and in the meeting of all the ridges around the axial canal. Schlueter's (4) figures of syzygial surfaces in *U. westfalicus* present a very different appearance, in that they show narrow grooves rather than ridges, which grooves have the same arrangement as the ridges in *U. socialis*. Both Schlueter's figures represent the upper surfaces of hypozygals, and it might be supposed that the under surfaces of the epizygals were ridged. But, in any case, it is odd that there should be no such grooved appearance in any hypozygals of *U. socialis*.

In describing the distribution of syzygies in an arm, it is the custom to reckon as one ossicle the two ossicles that are united by such a joint, and to transfer the term syzygy from the union to the pair of united ossicles. But "to my mind . . . it is a custom more honoured in the breach than the observance," and in another place[2] I have given reasons for adopting a method more consistent with both correct terminology and morphological ideas.

[1] "Ueber den Bau des *Pentacrinus caput medusæ*," Phys. Abh. Akad. Wiss. Berlin, Jahrg. 1841. See p. 213 and pl. ii. figs. 4 & 13 (1843).

[2] "The Term 'Syzygy' in the Description of Crinoids," Zool. Anzeig. vol. xix. pp. 57–61 (Feb. 3, 1896.)

In the present paper, at any rate, each brachial is treated as a unit, and the term syzygy is confined to its original meaning, viz., an immovable sutural union between two ossicles.

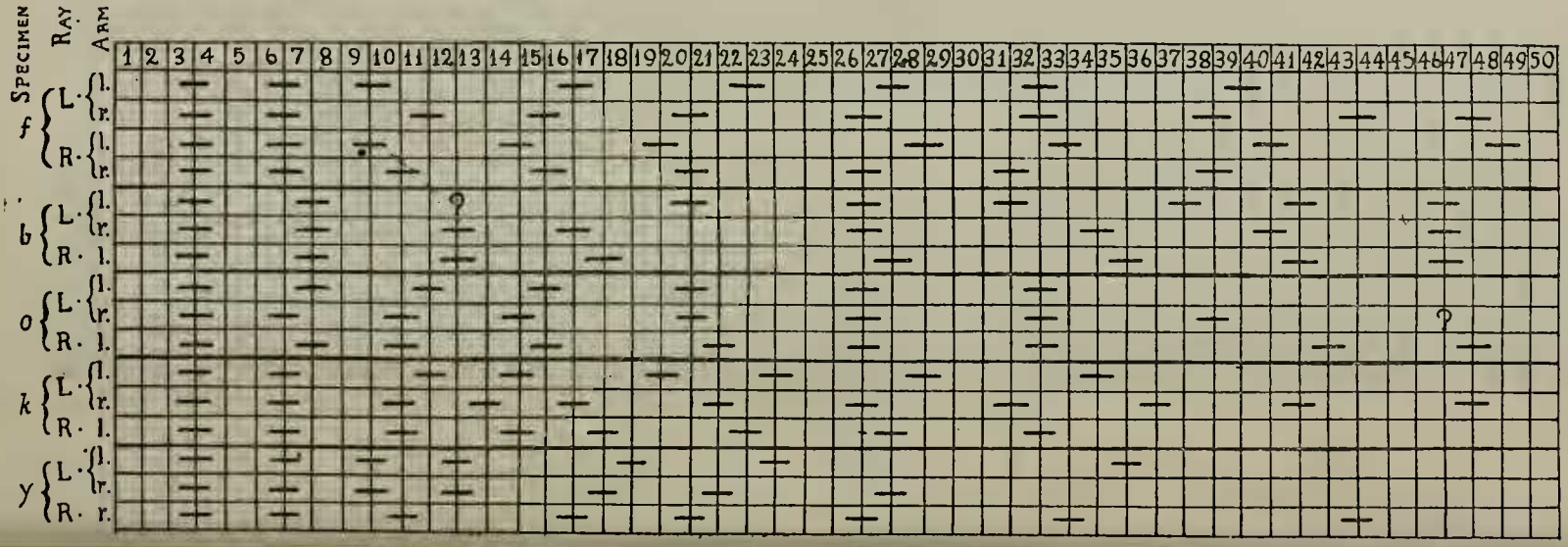
In the fixed region of the arm we may assume that the distribution of the syzygies is governed by the law of pinnulation above stated, that is to say, the non-pinnulate secundibrachs are taken to be hypozygals. For *U. westfalicus* this assumption is definitely confirmed by the observations of Schlueter (4), which show that the ossicles in question have a radiate upper joint-surface. In *U. socialis* this has not been seen, but in external appearance the supposed syzygial sutures are closer and finer than the rest. For $IIBr_{1-50}$ the distribution of the syzygies has been worked out in 16 arms belonging to 5 individuals, and the results are given in the accompanying diagrams (pages 992 & 993). It appears from these that the syzygial sutures occur at successive average intervals of 3, 4, 4, 5, 7, 5, 7, and 8 sutures. The persistent syzygial nature of the 26th suture is remarkable, and is one of those facts that would be obscured by the usual method of counting. The regularity of the syzygies seems to decrease in the more distal regions; that is to say, although in a single arm the intervals are fairly constant, yet there is considerable difference between individuals, possibly between the several arms of one individual. There is some reason to suppose that the interval between the syzygies is usually less in the proximal portion of the arm than it is in the median portion, but the evidence is insufficient. A long arm-fragment of medium width has syzygies at intervals of 10–15 sutures; but another much narrower arm-fragment of over 130 brachials has syzygies at intervals of 5–8 sutures, the usual intervals being 6 and 7.

The large number of the syzygies and their regular distribution throughout the whole length of the arms, doubtless bear some relation to the animal's mode of life. It is natural to suppose that syzygies have been developed to afford points of easy fracture, such as could never be presented by the muscular and ligamentary articulations. Thus, when an arm is entangled or is caught by some enemy, the crinoid merely breaks it off and swims or crawls away, happy in the knowledge that a new arm will soon grow from the stump. This explanation has been confirmed by the experiments of J. Walther on *Antedon rosacea*[1]. A *Uintacrinus*, with its sociable disposition, must often have found its long flexible arms inextricably interlaced with those of its fellows. Only by the syzygies can it have escaped from the too close embrace.

In the fixed portion of the arm the hypozygals and epizygals do not materially differ in height or appearance from the other fixed brachials. It would be preposterous to count $\overline{IIBr}_{3\&4}$, $\overline{IIBr}_{6\&7}$, or even $IIBr_{9\&10}$, as single morphological units, as would be done on the usual system of counting. After this, the hypozygals and

[1] "Untersuchungen ueber den Bau der Crinoiden," Palæontographica, xxxii. p. 180. (Oct. 1886.)

TABLE showing the position of Syzygies in 16 arm-branches of 5 individuals of *Uintacrinus socialis*. Each horizontal line represents an arm-branch, of which the proximal 50 secundibrachs are numbered; a black line unites those that form a syzygial pair.



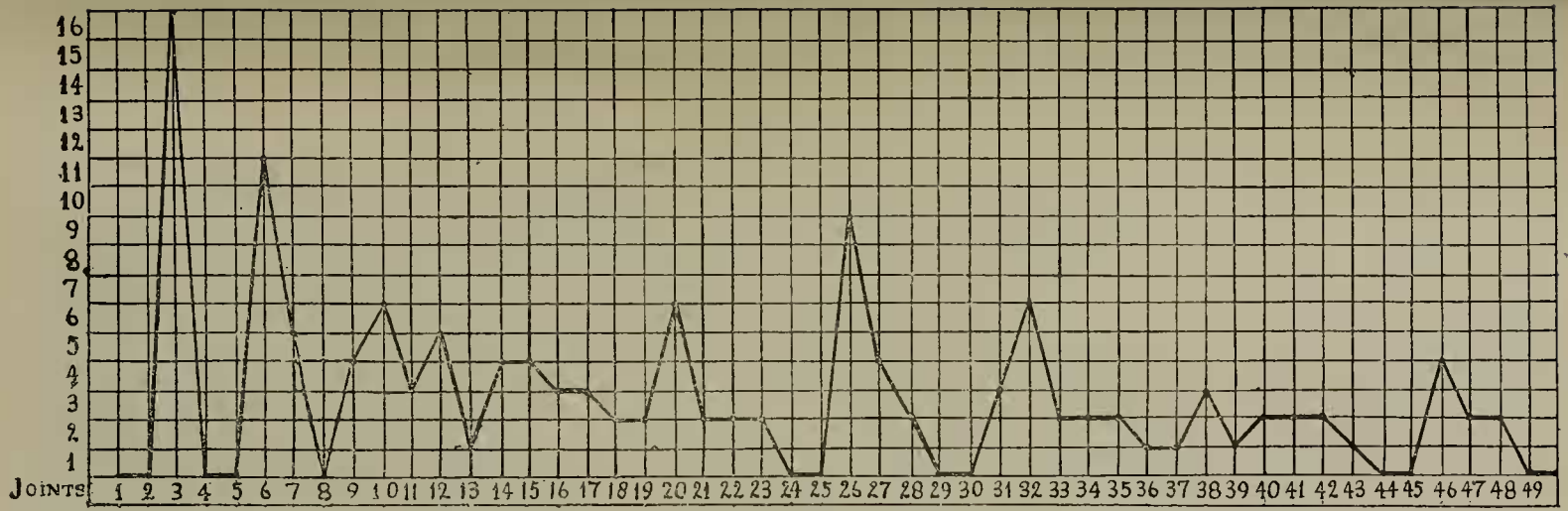


CHART showing the distributional curve of the Syzygies in the first 50 joints of the distichal arm of *Uintacrinus socialis*. The horizontal numbers (1–49) are on the joints, not on the ossicles; the vertical numbers (1–16) represent individual arm-branches.

epizygals gradually diminish slightly in height, till they become about two-thirds the height of an ordinary brachial, rarely less (Pl. LIV. fig. 11). It is often very hard to decide whether two adjacent ossicles are united by syzygy or no, so little do they differ in outward appearance from the neighbouring brachials. Occasionally the syzygial joint is a little less curved, as though there were some attempt at dovetailing, a suggestion of the structure in *Pentacrinus naresianus* and *P. blakei*.

The pinnules.—The law of pinnulation for the fixed pinnules has been discussed fully. That for the free brachials is the same as obtains in most modern crinoids: each ossicle, except the hypozygals, bears a pinnule, and the pinnules are on the right and left sides alternately. Viewed from the side of the arm, as in fig. 11 of Pl. LIV., the proximal ossicle of each pinnule appears sub-crescentic in outline, and lies in a corresponding semicircular notch, excavated in the upper corner of its brachial. The lower corner of the succeeding brachial is also slightly excavated, and the pinnulars fit closely up against it. In the case of a syzygy, the notch for the proximal pinnular may extend a little below the epizygal and include a small portion of the hypozygal. When seen from the back of the pinnule, each pinnular, with the exception of the proximal one, has its upper and lower margin parallel to each other; but seen from the side each ossicle has a sub-triangular outline, the base of the triangle being dorsal. This is seen to a slight extent in fig. 13 of Pl. LIV. In other words, each pinnular decreases in thickness towards the ventral side of the pinnule; and this enables the pinnule to curl upwards over the ventral groove of the arm. This feature is more marked in the proximal region of the pinnule than in the distal. As is usually the case with both arms and pinnules in the Crinoidea, the proximal ossicles of each pinnule are wider than high, while the distal ones are higher than wide. There are at least 30 ossicles in each pinnule; in some, 40 can be counted. In some cases the pinnulars show a concavity of the sides like that in the brachials (Pl. LIV. fig. 13).

On the ventral side each pinnule has a shallow groove (Pl. LIV. fig. 14). This was probably roofed by covering-plates, though none are preserved in the fossil. On either side of the groove, and at right angles to it, is a slight depression or channel in each pinnular. These may have been for the passage of the tentacles, or they may represent articular depressions for the covering-plates such as I have figured for *Cyathocrinus acinotubus* and *C. ramosus*[1]. The objection to the latter interpretation is that the covering-plates must in that case have been rather too large and solid to have so entirely disappeared.

The articular surfaces of the pinnulars (Pl. LIV. fig. 12) appear to show an axial canal separate from the ventral groove, and on either side thereof a depression for attachment of ligament, *i. e.* a

[1] "Crinoidea of Gotland," i. figs. 208 & 255, in Svensk. Vet.-Akad. Handl. xxv. 2 (1893).

bifascial articulation; but there is no defined ridge, and of course no such skewing from right to left as in the brachials. The pinnules gradually decrease in size towards the distal end of the arm, and eventually become of exceeding tenuity. Since they are rarely preserved or traceable for their whole length, measurements are difficult to make. A brachial 3·0 mm. wide bears a pinnule of which the proximal ossicle is 1·0 mm. wide. A brachial 2·5 mm. wide bears a pinnule of which the proximal ossicle is ·8 mm. wide, and the total length more than 11·5 mm. A brachial 2·0 mm. wide bears a pinnule of which the proximal ossicle is about ·5 mm. wide, and the total length fully 16·5 mm.

3. The Relations of Uintacrinus.

As already stated, there are no forms with which direct comparison is obvious. The discovery of the ancestry of *Uintacrinus* must therefore be a long process of induction. In prosecuting such an inquiry, the first step is to clear away secondary and accidental characters, so as, in any comparison, to utilize only those that are essential. It is, for instance, futile to lay any stress on the fact that *Uintacrinus* is an unstalked crinoid, and for that reason to compare it with its contemporary *Marsupites*. Worse still to follow H. A. Nicholson and P. H. Carpenter (7), and to place the two genera in a single family, though their organization differs in almost every other respect. As well place it with *Saccocoma*, or with *Agassizocrinus*, or any other stalkless crinoid. Surely the argument is absolutely the reverse. Features in which unstalked and free-swimming crinoids agree with one another are, it is probable, features due to similarity of environment rather than similarity of descent. The resemblance is physiological, not morphological. In short, one infers that such features are secondary, and not essential. They are the ones to be cleared away.

Let us consider the general and **common characters of unstalked crinoids.** All agree in the absence of a stem in the adult; but, when further compared, they are soon seen to fall into three distinct groups. First, the group in which a portion of the stem remains, becoming modified into a cirrus-bearing centrodorsal, as in *Antedon*, *Eudiocrinus*, and *Thaumatocrinus*. These forms anchor themselves by their cirri, and though capable of crawling, climbing, and swimming, do not often exercise their faculty of locomotion. Secondly, the group in which either a portion of remaining stem, or the lower part of the cup (*i. e.* basals or infrabasals), becomes solidified, usually by additional deposition of stereom, into a knob, which, one may suppose, serves as ballast or as a sea-anchor; such forms are *Agassizocrinus*, *Edriocrinus*, and *Millericrinus pratti*. Both of these groups have a small calycal cavity with thick walls, and there can be little doubt but that all are attached by a stem in the earlier stages of ontogeny. The third group, comprising *Marsupites*, *Saccocoma*, and *Uintacrinus*, has no trace of a stem or

of any anchoring structure, but is in all respects adapted for free locomotion; the calycal cavity is large in proportion to the thickness of the arms, and is enclosed by thin flexible walls. Of these three genera, *Saccocoma* is the most specialized; as Otto Jaekel concludes in his detailed and interesting account, "The totality of organization and the mode of occurrence of the Saccocomidæ indicate that they were pelagic animals, and that, as such, they not merely lived in swarms, but inhabited every peaceful basin of the Solenhofen sea in enormous numbers" (Zeitschr. deutsch. geol. Gesell. xliv. p. 689, 1893). *Marsupites* also was perhaps pelagic; the plates of its skeleton are, as I intend to show in another paper, of very light construction and with flexible unions; the specific gravity of the whole animal must have been light and perhaps still further lightened, as Jaekel suggests for *Saccocoma*, by "a slight development of gas within the body." *Uintacrinus*, with its large calyx, its thin flexible test, its extraordinarily long and movable arms, appears likewise to possess the characters of a pelagic organism; and so far as the argument from mode of occurrence is of any value in the case of *Saccocoma*, it is just as applicable in the case of *Uintacrinus*, or at all events *U. socialis*, which lived in similar swarms and is buried in a similar deposit. As for *U. westfalicus*, its gregariousness may be open to dispute, but it is to be noted that the one specimen known occurs in association with *Marsupites*. At any rate, *Uintacrinus*, *Marsupites*, and *Saccocoma* appear to have had much the same mode of life, and to have been subject to similar environment.

Let me repeat that the word group, as used in the preceding paragraph, is of physiological and not morphological significance. It implies identity of condition but not of ancestry. Take any one of these groups, and what could be more divergent than the forms therein included? *Thaumatocrinus* is essentially so unlike *Antedon* that, had the two genera not chanced to be both furnished with a centrodorsal, not a soul could have been led to place them in a single family, or even, one would imagine, in a single order. In the second group, *Agassizocrinus* is a dicyclic Inadunate, apparently allied to *Cromyocrinus*; *Edriocrinus* is a monocyclic Inadunate of obscure, but undoubtedly very different, affinities; *Millericrinus pratti* is but a single species of a well-known genus of Pentacrinidæ, and is pseudo-monocyclic. So is it with our third group: *Saccocoma* has a cup of nothing but radials; *Marsupites* has radials, basals, and infrabasals; *Uintacrinus* has no infrabasals, but, in addition to its basals and radials, has brachials, interbrachials, interdistichals, pinnulars, and interpinnulars, all helping to compose its dorsal cup.

Admitting the essential dissimilarity of the three forms in our third, or pelagic, group, we see the sooner what are the **secondary features due to environment**, the necessary consequences of their line of evolution. They are the features in which these three dissimilar forms have come to resemble one another. The thinness of the test, the large size of the calycal cavity, the flexibility of

both test and arms, are obvious points that have already been alluded to. It is also noteworthy that each of these very differently constituted cups resembles the others in one curious feature, namely, the presence of a central, pentagonal, apical plate. One may say, if one chooses, that in *Saccocoma* this represents the fused basals, and in *Uintacrinus* the fused infrabasals; but in *Marsupites* it must be something else. Or one may say that in each case it is the same element, be it the proximal stem-ossicle (which some erroneously call "centrodorsal"), or the distal stem-ossicle (which some, seeking an homology, have called "dorso-central"), or perhaps a new plate altogether, a simple supplementary plate developed to fill up the gap left by the disappearance of the stem. One might argue for ever: there is no evidence. The one obvious fact is that such a central plate is found in three very different forms, all of which were free-swimming, and unlike all other crinoids in showing absolutely no trace of a stem. It is therefore not safe to ascribe to the central plate any morphological significance, or to give it any name other than "centrale."

The large size of the body is produced in *Marsupites*, and still more in *Saccocoma*, by the largeness of the plates; in *Uintacrinus* it is produced by the incorporation of many brachials, interbrachials, &c. into the dorsal cup. The large size being probably a secondary character, it is not fair to argue that the ancestors of *Uintacrinus* had so many plates in the dorsal cup; although we must infer that they were forms that had a tendency to this mode of enlargement of the cup.

The **essentials of structure** in *Uintacrinus* appear thus to be: 5 basals; 5 radials; 5 arms, branching once; the two primibrachs, at least, united by interbrachial; pinnules borne by secundibrachs, beginning with $IIBr_2$; a tendency for proximal pinnules to coalesce; an axial canal separated from the ventral groove of the brachials.

As claimants to provide an ancestor for *Uintacrinus* the **Camerata**, notwithstanding the superficial resemblance in the cup of many of them to this genus, must at once be put out of court as having no separate axial canal in the arms. The flexible tegmen of *Uintacrinus* is also removed from the Camerate type. Indeed, so far as I am aware, Jaekel (**10**) is the only writer of repute that has endeavoured to find the ancestor of *Uintacrinus* in this order. The Rhodocrinidæ, however, which are the forms he fixes on, are far removed from *Uintacrinus*, in the possession of branched, biserial arms, and interradials resting on the basals.

This leaves, among Palæozoic crinoids, from which one presumes that Mesozoic crinoids are descended, the Inadunata and the Ichthyocrinacea (=Articulata, W. & Sp., Flexibilia, Zittel).

Most if not all of those palæontologists that have attempted an answer have decided in favour of the **Ichthyocrinacea**, usually pitching on *Forbesiocrinus* as their example of a similar form. Held, as it has been, by Zittel (**5** and **11**), Neumayr (**6**), Carpenter (**7**),

and apparently by Schlueter (4), who, however, cleverly shirked giving a definite reply, this opinion demands respectful consideration. The opinion will be more acceptable if *Onychocrinus* be substituted for *Forbesiocrinus*. For in *Onychocrinus* one finds what does not occur in *Forbesiocrinus*, namely a differentiation of the arms into two main branches, with a tendency for the armlets to be reduced to the size and regularity of pinnules. This tendency is most obvious in the species for which R. R. Rowley [1] proposed two generic names in a single paper, viz., *Aristocrinus*, or *Callawaycrinus*, *concavus*. Considering the extreme difficulty that the most acute palæontologists have met with in distinguishing the genera *Ichthyocrinus*, *Taxocrinus*, *Forbesiocrinus*, *Onychocrinus*, and their allies, considering the impossibility of deciding such a question with the assistance of the comparatively few specimens or species in the British Museum, and considering the confused nature of the large and scattered literature, I would not, on the slight evidence offered by Mr. Rowley, venture to pass any criticism on his action other than that the name *Aristocrinus*, or "the best crinoid," is singularly inappropriate. Names and minor differences apart, we find in this group of forms many species with small and disappearing infrabasals, with interbrachials forming a flexible union between the rays, with occasional interdistichals, with the proximal primibrachs and secundibrachs broad-backed thin plates very like those of *Uintacrinus*, with an axial canal differentiated in at least the more distal brachials, with a flexible tegmen, and with flexible arms and cup; and some species with a distichal and sub-pinnulate arm-structure, and with two primibrachs in each ray. In all these features, then, there is a noteworthy resemblance; but a closer inspection will reveal many important points of difference. The species to which reference has been made have an anal area distinct in the cup, such as there is no trace of in *Uintacrinus*. This, however, might well disappear in course of evolution, especially in a free-swimming form, just as it has disappeared in *Encrinus* and in *Antedon*, although undoubtedly present in the ancestors of those two genera. It is more important to notice that the interradially situate plates of the Ichthyocrinidæ are all of them true interbrachial plates of the secondary system; they are none of them modified pinnules. Indeed the pinnules are in no case advanced to such a stage that they could coalesce as in *Uintacrinus*. The most one can say is, that in some species of *Ichthyocrinus* the brachials seem to have been united laterally. Again, there are no traces of syzygial union in the arms of the Ichthyocrinidæ. Indeed the arms are so much less differentiated, even in *Onychocrinus*, than they are in *Uintacrinus*, that if one supposes any links between the two forms, one must suppose a very long chain of them. But of this chain, not one link is known. Therefore, though I admit the force of the

[1] "Description of a new Genus and five new Species of Fossils from the Devonian and Sub-Carboniferous Rocks of Missouri," Amer. Geol. xvi. pp. 217–223 (Oct. 1895).

arguments of those eminent authorities who, with Neumayr (6), "regard it as most probable that *Uintacrinus* is a last straggler of the Ichthyocrinidæ," yet I cannot but consider the counter-arguments, here first definitely stated, as of even greater weight. One may also add the fact that none of the known Flexibilia show that predilection for a free mode of life that is so common in the order next to be considered.

Turning to the **Inadunata**, we have to choose between monocyclic and pseudo-monocyclic forms; since, had the immediate progenitors of *Uintacrinus* well developed infrabasals, one must suppose that these would have been retained and utilized to expand the walls of the cup, as in *Marsupites*.

Among **Inadunata monocyclica** choice is at the outset limited to those genera whose symmetry is not disturbed either by the transverse bisection of certain radials or by the greater development of certain other radials. From these more symmetrical forms, again, must be removed those that have simple unbranched arms, such as *Hoplocrinus*, *Hybocrinus*, *Symbathocrinus*, and *Cupressocrinus*. *Iocrinus*, with its dichotomus, non-pinnulate arms, is also out of the question; while one need hardly mention such undeveloped genera as *Gasterocoma*, *Lageniocrinus*, and *Allagecrinus*. Thus *Belemnocrinus*, if correctly placed here, is the only genus remaining; in its bifurcate, sub-pinnulate arms, richly provided with syzygies, and in the structure of its cup, it certainly presents more resemblance to *Uintacrinus* than do any of the other genera; but in its large anal tube, and in the entire absence of any plates binding together the brachials, it is still far removed from our genus.

The field of choice is now narrowed down to the **Inadunata dicyclica** and their descendants in the Mesozoic era, the **Canaliculata**. The earlier fistulate forms, with their asymmetrical anal areas, may be at once set aside; so may all genera with many-branched arms, whether pinnulate or non-pinnulate. Thus we are restricted to such genera as *Erisocrinus*, *Stemmatocrinus*, *Encrinus*, *Dadocrinus*, and some species of Pentacrinidæ. At first sight there appears mighty little resemblance between these and *Uintacrinus*; so little that no one has ever dreamed of mentioning them in this connection. Yet it is here, and here only, that we find those essentials of structure that have been proved requisite in the ancestors of *Uintacrinus*. A large number of these genera agree in the possession of 5 basals, 5 radials, two primibrachs in each radius, arms bifurcating once, bearing pinnules, and with a separate axial canal. The earlier genera have distinct infrabasals; but the later genera are pseudo-monocyclic, the infrabasals being either absorbed or hidden in the adult, and occasionally fused with one another. It has already been suggested that *Uintacrinus* was more likely to be descended from a pseudo-monocyclic than from a dicyclic ancestor. Some species of these pseudo-monocyclic genera have the primibrachs united by interbrachial plates. Schlueter (4) has referred to *Guettardicrinus*, in which the primibrachs are

separated by small but well-defined interbrachials, while a few interdistichals are also present; interbrachials also occur in *Apiocrinus roissyanus* and *A. elegans*. In both these forms, however, the plates of the cup are too thick, and the arms too much branched, for us to infer any direct affinity with *Uintacrinus*. I refer to these facts merely to show the possibility of a development of interbrachials and interdistichals among the genera of the group. Similarly the Pentacrinidæ, notably *Extracrinus*, may develop interbrachials; and in *E. lepidotus*, at any rate, the proximal pinnules seem to have been laterally united, forming thin scaly plates. Moreover the whole arm-structure of *Uintacrinus* is singularly like that of the Pentacrinidæ. But we must look for a form not so highly modified, and one in which the arrangement of syzygies and pinnules does not conflict with the law of their arrangement in *Uintacrinus*. Thus, by a gradual process of elimination, we are forced back upon *Dadocrinus*, and here indeed appears to be the object of our search.

The genus **Dadocrinus**, based by H. von Meyer on *Encrinus gracilis*, von Buch, which has been investigated by Beyrich, Kunisch, Gürich, Wachsmuth and Springer, and above all by A. von Koenen [1], is admitted to be an ally of *Erisocrinus*, *Stemmatocrinus*, and *Encrinus*, and to be intermediate between them and the Pentacrinidæ and Apiocrinidæ. Whether or no it be the actual ancestor of the latter families, it at least comes as near as possible to what that ancestor must have been. It is pseudo-monocyclic, has 2 primibrachs, pinnulate arms bifurcating once, with a separate axial canal; its primibrachs are united by a number of small interbrachials which pass up into a thin-plated flexible tegmen. The arrangement of pinnules and syzygies in the proximal region of the arms is governed by the same law, and subject to the same regular exceptions, as in *Uintacrinus* (fig. 13)[2]. The proximal pinnules are larger than the others, and have flat backs and square sides, thus resembling the coadunate pinnules of *Extracrinus*. Now in all these essential points of structure, *Dadocrinus gracilis* agrees precisely with *Uintacrinus*. All that we have to suppose is a gradual exaggeration of these features and the loss of the stem. The former is a natural supposition, since, as has just been shown,

[1] "Beitrag zur Kenntniss der Crinoiden des Muschelkalks," Abh. Ges. Wiss. Göttingen, xxxiv. Phys. Kl. i. pp. 1–44, pl. i. (1887), and "Ueber die Entwicklung von *Dadocrinus gracilis*, v. Buch, und *Holocrinus wagneri*, Ben., und ihre Verwandtschaft mit anderen Crinoiden," Nachrichten Ges. Wiss. Göttingen, Math.-phys. Kl. Jahrg. 1895, pp. 283–293 (pages 292, 293 being wrongly imposed), 14th Dec., 1895. In these papers references to the rest of the literature will be found.

[2] Von Koenen (*op. cit.* 1895) describes the pinnules as borne on the outer side of $IIBr_2$, on the inner side of $IIBr_4$, and thence regularly on each secundibrach, on the outer and inner sides alternately. The syzygies that are to be inferred from this arrangement agree with the plan of *Uintacrinus*. But I have found yet other arrangements, which make the resemblance still more striking. A slab in the British Museum (E 6070) enables one to trace the arrangement in several arms. The commonest type has syzygies between secundibrachs 1 & 2, 3 & 4, 6 & 7; pinnules are borne by the epizygals and by $IIBr_5$, first on the

much the same thing occurs in the Pentacrinidæ and Apiocrinidæ. If *Dadocrinus*, or an allied form, is the ancestor of *Pentacrinus* in one direction, of *Apiocrinus* in another direction—then why not of *Uintacrinus* in a third direction? As to the loss of the stem, it may have been by a process of gradual diminution, or in consequence of a habit of sudden separation. In favour of the former view are the instances of many species of *Pentacrinus*, which are known to move from place to place, and especially of *Millericrinus pratti*, the stem of which gradually dwindles to nothing. In favour of the latter view is the suggestive fact that in the slabs of fossil *Dadocrinus* the crown is almost always broken off from the stem either at, or immediately below, the junction of the stem with the cup; and this must have taken place as a reflex response to some stimulus rather than as the result of force, for the crowns are otherwise undisturbed, and are still in natural juxtaposition with

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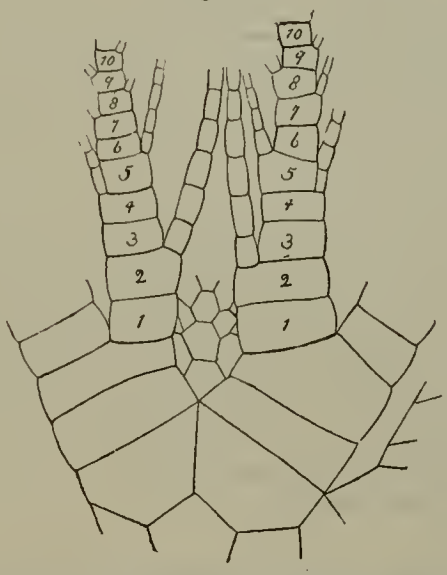
outer, then on the inner side, and so on regularly. One variation shows syzygies between secundibrachs 1 & 2, 3 & 4, 5 & 6. Another shows syzygies between secundibrachs 1 & 2, 3 & 4, 5 & 6, 8 & 9. Professor von Koenen has obliged

Fig. 13.



Dadocrinus gracilis, portion of a specimen from Sacrau, near Gogolin in Silesia, Brit. Mus. E 6070. The drawing shows basals, radials, primibrachs, secundibrachs (or distichals), pinnules, and interbrachials. Magnified 5 diameters.

me by examining his numerous specimens with reference to this point, and admits that such differences from his own account do occur. He is at variance with me only in considering them "anomalous;" but there is nothing really anomalous about them, for the law of alternate pinnulation is never abrogated. The only question is, which type is the most usual. The one Von Koenen finds most often, I find most seldom. Both, however, agree with *Uintacrinus* so far as they go.

the stems[1]. Which view be ultimately accepted must depend on the evidence of intermediate stages actually found fossil, stages that shall bear the same relation to *Uintacrinus* as *Thiollericrinus* bears to *Antedon*. It is true that such links are still to seek; but the number of missing links is far fewer on this hypothesis than on any other that has hitherto been advanced.

4. Summary.

This paper attempts a complete morphological description of *Uintacrinus socialis*, and a comparison of it with *U. westfalicus*. The deficiencies of previous accounts are made good, and the errors of them corrected: this is specially the case with regard to the interbrachials, interpinnulars, brachials, pinnules, and joints. The more accurate knowledge thus obtained enables a comparison with other crinoids to be based on something more than external appearances. It is thus shown that *Uintacrinus* cannot be related either to the Camerata, e. g. to *Rhodocrinus* as Jaekel has supposed, or to the Ichthyocrinidæ as maintained by Von Zittel, Neumayr, and others. It must therefore be related either to the Palæozoic Inadunata or to their Mesozoic descendants, the Canaliculata (=Articulata of Müller). Among these, a process of comparison and elimination leaves behind only the ascending evolutionary line that contains *Encrinus*, *Dadocrinus*, *Pentacrinus*, and *Apiocrinus*; and a simple inspection then enables us to fix on *Dadocrinus* as the one among all known genera that is the most nearly related to the ancestor of *Uintacrinus*.

Whether this conclusion be right or wrong, I should like to point out that it was not present to my mind when this investigation was begun, and that it has been arrived at solely by observation of a large number of facts and by simple induction from those facts. The circumstance that this conclusion differs from those of more eminent writers arises partly from the revision and increase of the facts concerning *Uintacrinus* itself, partly from the broader principles that a more accurate knowledge of the Crinoidea now enables us to apply. Knowledge cannot be too accurate or too detailed. It is not till the details have been accumulated that we can understand their meaning.

[1] *Cf.* D. C. Danielssen, "Crinoida," Norske Nordhavs-Exped. xxi., Zoologi, pp. 11–14 (1893); also Editorial on "Autotomy in Echinoderms," Natural Science, vol. v. p. 4 (July 1894).

5. The Literature of Uintacrinus.

1. 1871. Marsh, O. C.—"On the Geology of the Eastern Uintah Mountains." Amer. Journ. Sci. (3) i. pp. 191–198. March. The reference to the new crinoid is on p. 195.
2. 1876. Grinnell, G. B.—"On a new Crinoid from the Cretaceous Formation of the West." Amer. Journ. Sci. (3) xii. pp. 81–83, iv. July.
3. 1876. Meek, F. B.—"Note on the new genus *Uintacrinus*, Grinnell." Bull. U. S. Geol. & Geog. Survey, ii. pp. 375–378. August.
4. 1878. Schlueter, C.—"Ueber einige astylide Crinoiden." Zeitschr. deutsch. geol. Ges. xxx. pp. 28–66, i–iv. "iii. *Uintacrinus Westfalicus*, ein ungestielter tesselater Crinoid aus dem Senon Norddeutschlands," pp. 55–63, Taf. iv. figs. 1–5.
5. 1879. Zittel, K. A.—Handbuch der Palaeontologie. Palaeozoologie, I. Familie Uintacrinidæ, pp. 373–374.
6. 1889. Neumayr, M.—Die Stämme des Thierreiches. I. See esp. pp. 484–486.
7. 1889. Nicholson, H. A., & Lydekker, R.—A Manual of Palæontology, etc. Vol. i. Chapters on Echinoderma revised by *P. Herbert Carpenter*; see esp. p. 442.
8. 1893. Clark, W. B.—"The Mesozoic Echinodermata of the United States." Bull. U.S. Geol. Surv. 97. See esp. pp. 21–24, pls. i.–ii.
9. 1894. Williston, S. W., & Hill, B. H.—"Notes on *Uintacrinus socialis*, Grinnell." Kansas Univ. Quarterly, iii. pp. 19–21. July.
10. 1894. Jaekel, O.—"Die Morphogenie und Phylogenie der Crinoiden." Sitzungsber. Ges. naturf. Freunde Berlin, 1894, pp. 101–121. See esp. p. 114.
11. 1895. Zittel, K. A. von.—Grundzüge der Palaeontologie (Palaeozoologie). 8vo. See esp. p. 139.

6. EXPLANATION OF THE PLATES.

Plate LIV.

Structure of Uintacrinus socialis.

Fig. 1. The apical system of specimen *c*, in E 6327. × 3.
Fig. 2. Articular or joint surface of a normal brachial, showing oblique fulcral ridge. × 10.
Fig. 3. Ditto. × 24.
Fig. 4. Joint-surface of a syzygial brachial. × 9.
Fig. 5. Ditto. × 10.
Fig. 6. Joint-surface of a normal brachial from the proximal region of the arm. × 6.
Fig. 7. Joint-surface of a normal brachial. × 4.
Fig. 8. Joint-surface of a normal brachial from the proximal region of the arm; the two halves of the fulcral ridge appear to be at an angle to one another. × 13.
Fig. 9. Joint-surface of a normal brachial, showing at top right-hand corner the facet for the pinnule. × 4.
Fig. 10. Joint-surface of a normal brachial; the fulcral ridge runs in a direction at right-angles to that in figs. 2 & 3. × 4.
Fig. 11. Portion of an arm, showing origin of pinnules, the fourth joint from the right is a syzygy. × 4.
Fig. 12. Joint-surface of a pinnular, showing axial canal with ligament-depression on either side. × 30.
Fig. 13. A single brachial, bearing on its right side a pinnule, of which ten ossicles are preserved. × 6.
Fig. 14. Portion of a pinnule from the ventral side; the pinnulars are slightly shifted, so that portions of their proximal joint-surfaces are seen. × 12.

Figs. 1, 11, 12, 13, 14 are by F. O. Pickard Cambridge, the rest by the author, and are all taken from E 6327.

Plate LV.

An attempt at an exact restoration of *Uintacrinus socialis*, represented as swimming, five alternate arms raised, and five in the act of depression. The various twists and coils of the arms are but slightly modified from actual specimens. The length of the arms is based on calculations from the specimens (see pages 987–8). The drawing was made of the natural size, by Mr. F. O. Pickard Cambridge, under the direction of the author, and has been reduced photographically to about one-sixth natural size.

Plate LVI.

Uintacrinus socialis.

This is a reproduction of Clark's (7) plate i. from Bull. U.S. Geol. Surv. no. 97. The electrotype of the original block was very kindly sent by Mr. C. D. Walcott, Director of the U.S. Geological Survey, and my best thanks are due to him for permission to use it.

Fig. 1*a*. "Lateral view of the test, with interradial area central, natural size." This clearly is taken from one of the specimens figured by Meek (3). Compare text-figure 2, page 976.
Fig. 1*b*. "Test with arms." This also is doubtless natural size.
Fig. 1*c*. "A radial [*i. e.* interdistichal] area, magnified two diameters."

APPENDIX.

LIST OF ADDITIONS TO THE SOCIETY'S MENAGERIE

DURING THE YEAR

1895.

Jan. 1. 2 Long-nosed Crocodiles (*Crocodilus cataphractus*). From the Bonny River, W. Africa. Presented by Capt. F. W. Raisin.

4. 1 Black-eared Marmoset (*Hapale penicillata*). Presented by the Lord Auckland, F.Z.S.

1 Sparrow-Hawk (*Accipiter nisus*). Presented by A. M. Lees-Milne, Esq.

5. 1 Pardine Genet (*Genetta pardina*). Presented by F. E. W. Batt, Esq., Lt. 1st W. I. Regt.

1 Two-spotted Paradoxure (*Nandinia binotata*). Presented by F. E. W. Batt, Esq., Lt. 1st W. I. Regt.

2 Grey Parrots (*Psittacus erithacus*). Deposited.

1 Robben-Island Snake (*Coronella phocarum*). Presented by G. R. Picton Thwaites, Esq.

14. 1 Derbian Wallaby (*Halmaturus derbianus*), ♀. Presented by Mr. Joseph Palmer.

1 Rose-billed Duck (*Metopiana peposaca*), ♂. Purchased.

1 Garden's Night-Heron (*Nycticorax gardeni*). Purchased.

3 Eroded Cinixys (*Cinxys erosa*). Presented by J. Banks Elliott, Esq.

2 Home's Cinixys (*Cinixys homeana*). Presented by J. Banks Elliott, Esq.

15. 1 Dusty Ichneumon (*Herpestes pulverulentus*). Presented by J. E. Matcham, Esq.

16. 1 Macaque Monkey (*Macacus cynomolgus*), ♀. Presented by H. Ralls, Esq.

1 Black-backed Jackal (*Canis mesomelas*). Presented by Mr. Fred. Bissmire.

1 Jackal Buzzard (*Buteo jacal*). Presented by E. Wingate, Esq.

1 White-throated Monitor (*Varanus albigularis*). Presented by J. E. Matcham, Esq.

1 Lesueur's Water-Lizard (*Physignathus lesueuri*). Deposited.

17. 1 Yellow-headed Conure (*Conurus jendaya*). Presented by Mrs. Hankey.

1 Brown-throated Conure (*Conurus æruginosus*). Presented by Mrs. Hankey.

Jan. 21. 1 Hog Deer (*Cervus porcinus*), ♀. Born in the Menagerie.
1 Little Auk (*Mergulus alle*). Presented by Hamon Le Strange, Esq., F.Z.S.
2 Mantell's Apteryxes (*Apteryx mantelli*). Deposited.
22. 1 Cardinal Grosbeak (*Cardinalis virginianus*), ♂. Presented by F. Beresford Wright, Esq.
1 Little Auk (*Mergulus alle*). Presented by Col. Feilden.
25. 1 Black Iguana (*Metopoceros cornutus*). Deposited.
26. 1 Macaque Monkey (*Macacus cynomolyus*), ♀. Presented by Miss Teresa M. L. Monteath.
1 Guillemot (*Lomvia troile*). Purchased.
2 Leopard Tortoises (*Testudo pardalis*). Presented by J. E. Matcham, Esq.
1 Cape Bucephalus (*Bucephalus capensis*). Presented by J. E. Matcham, Esq.
28. 1 Chacma Baboon (*Cynocephalus porcarius*), ♂. Presented by Capt. Webster.
31. 1 White-throated Capuchin (*Cebus hypoleucus*). Presented by H. W. Manning, Esq.

Feb. 2. 1 Senegal Parrot (*Pœocephalus senegalus*). Presented by Miss Firmin.
4. 1 Lion (*Felis leo*), ♂. Presented by H.R.H. The Duke of Connaught, K.G., F.Z.S.
8. 1 Cape Bucephalus (*Bucephalus capensis*). Presented by J. E. Matcham, Esq.
12. 1 Snowy Owl (*Nyctea scandiaca*). From Norway. Presented by Miss Wright.
16. 1 Dunlin (*Tringa alpina*). Purchased.
18. 1 Hairy-rumped Agouti (*Dasyprocta prymnolopha*). Presented by Miss W. B. Jackson.
1 Fieldfare (*Turdus pilaris*). Presented by Gervase F. Mathew, Esq.
19. 1 Eland (*Oreas canna*), ♀. Born in the Menagerie.
2 Collared Fruit-Bats (*Cynonycteris collaris*). Born in the Menagerie.
22. 1 Derbian Wallaby (*Halmaturus derbianus*), ♂. Presented by Miss H. M. Howes.
23. 1 Lion (*Felis leo*), ♂. From Harar, Somaliland. Presented by H.M. The Queen.
2 Lions (*Felis leo*), ♂ ♀. From Harar, Somaliland. Deposited by H.M. The Queen.
1 Roseate Cockatoo (*Cacatua roseicapilla*). Presented by A. Reynart, Esq.
4 Triangular-spotted Pigeons (*Columba guinea*). Presented by J. E. Matcham, Esq.
2 Moorish Harriers (*Circus maurus*). Presented by J. E. Matcham, Esq.
2 Spotted Eagle-Owls (*Bubo maculosus*). Presented by J. E. Matcham, Esq.
25. 2 Sclater's Penguins (*Eudyptes sclateri*). Deposited.
26. 1 Giraffe (*Camelopardalis giraffa*), ♀. From the Sabri River, S.E. Africa. Purchased. See P. Z. S. 1895, p. 161.
2 Brindled Gnus (*Connochætes taurina*), ♂ ♀. Purchased. See P. Z. S. 1895, p. 161.
2 Sable Antelopes (*Hippotragus niger*), ♂ ♀. Purchased. See P. Z. S. 1895, p. 161.

Feb. 26. 1 Black-headed Gull (*Larus ridibundus*). Presented by Mrs. Rees Davis.
28. 1 Levaillant's Cynictis (*Cynictis levaillanti*). Purchased.
4 Black Francolins (*Francolinus vulgaris*), 1 ♂, 3 ♀. Deposited.

Mar. 1. 1 Jackal Buzzard (*Buteo jacal*). Presented by J. E. Matcham, Esq.
1 Robben-Island Snake (*Coronella phocarum*). Presented by Dr. Arthur Bensusan.
1 Robben-Island Snake (*Coronella phocarum*). Deposited.
2. 2 Great Eagle-Owls (*Bubo maximus*). Purchased.
4. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Mrs. Turner-Turner.
1 Sykes's Monkey (*Cercopithecus albogularis*), ♀. Purchased.
1 Azara's Fox (*Canis azaræ*). Presented by Messrs. Edgar and Harold Turner.
2 Red-crested Pochards (*Fuligula rufina*), ♂ ♀. Purchased.
6. 1 Great Kangaroo (*Macropus giganteus*), ♂. Born in the Menagerie.
4 Amaduvade Finches (*Estrelda amandava*). Presented by Mrs. Faulknor.
1 Chukar Partridge (*Caccabis chukar*), ♀. Deposited.
8. 3 Hunter's Spiny Mice (*Acomys hunteri*). Born in the Menagerie.
11. 4 Marbled Newts (*Molge marmorata*). Purchased.
12. 1 Vulpine Phalanger (*Phalangista vulpina*). Presented by Richmond Allen, Esq., F.R.C.S.
1 Long-necked Chelodine (*Chelodina longicollis*). Deposited.
13. 1 Macaque Monkey (*Macacus cynomolgus*), ♂. Presented by Miss K. Fleming.
1 Grey Ichneumon (*Herpestes griseus*). Presented by Mrs. Lewis.
14. 15 Pacific Rats (*Mus exulans*). From Sunday Island, Kermadec Group. Presented by the Countess of Glasgow.
1 Hooded Finch (*Spermestes cucullata*). Presented by C. H. Hastings, Esq.
1 Chestnut-eared Finch (*Amadina castanotis*). Presented by C. H. Hastings, Esq.
1 Woodcock (*Scolopax rusticula*). Presented by Chas. Smoothy, Esq.
15. 1 Vervet Monkey (*Cercopithecus lalandii*), ♀. Presented by Capt. Scarlett Vale.
18. 1 Sand-Badger (*Meles ankuma*). Presented by Fred. Ringer, Esq.
1 Black-backed Piping-Crow (*Gymnorhina tibicen*). Presented by Mrs. J. D. Haggard.
19. 2 Polar Bears (*Ursus maritimus*), ♂ ♀. Presented by John I. Hughes, Esq.
1 Purple-breasted Lory (*Eos riciniata*). Purchased.
1 Blue-faced Honey-eater (*Entomyza cyanotis*). Purchased.
21. 1 Chimpanzee (*Anthropopithecus troglodytes*), ♀. Deposited.
1 Raven (*Corvus corax*). Presented by W. Hillary, Esq.
1 Puff-Adder (*Vipera arietans*). Presented by Dr. A. Donaldson Smith.
22. 1 Common Marmoset (*Hapale jacchus*). Deposited.
1 Spotted Hyæna (*Hyæna crocuta*, jr.). From British East Africa. Presented by T. E. C. Remington, Esq.